CHAPTER 7

TRACTOR-TRAILERS AND DUMP TRUCKS

Tractor-trailers and dump trucks are used to haul equipment, construction supplies, and materials used to support construction operations, disaster recovery operations, the preventive maintenance program, and so forth. This chapter covers the basic principles of tractor-trailer and dump truck operations.

TRACTOR-TRAILERS

Thousands of miles of tractor-trailer operations are generated during a deployment. These operations include the hauling of equipment and construction supplies in support of NMCB/NCF tasking. You, as an operator, must remember that when tractor-trailers are on the open road, they represent the U.S. Navy and the Seabees to the public.

The tractor, technically known as a **truck-tractor,** may have a gasoline- or diesel-powered engine, be equipped with an automatic or manual transmission, and range in capacity from 5 tons through 25 tons. Some examples are shown in figure 7-1.

NOTE: Because of the variety of transmission types in truck-tractors used by the NCF, it is important that you study the operator's manual before operating a certain model of truck-tractor. The operator manuals are located in the Technical Library.

Operator's errors, such as grinding gears while shifting, clutch slipping, rapid engagement during shifting, improper downshifting, and so forth, often cause premature failure of drive-line components, resulting in needless downtime and delays in production.

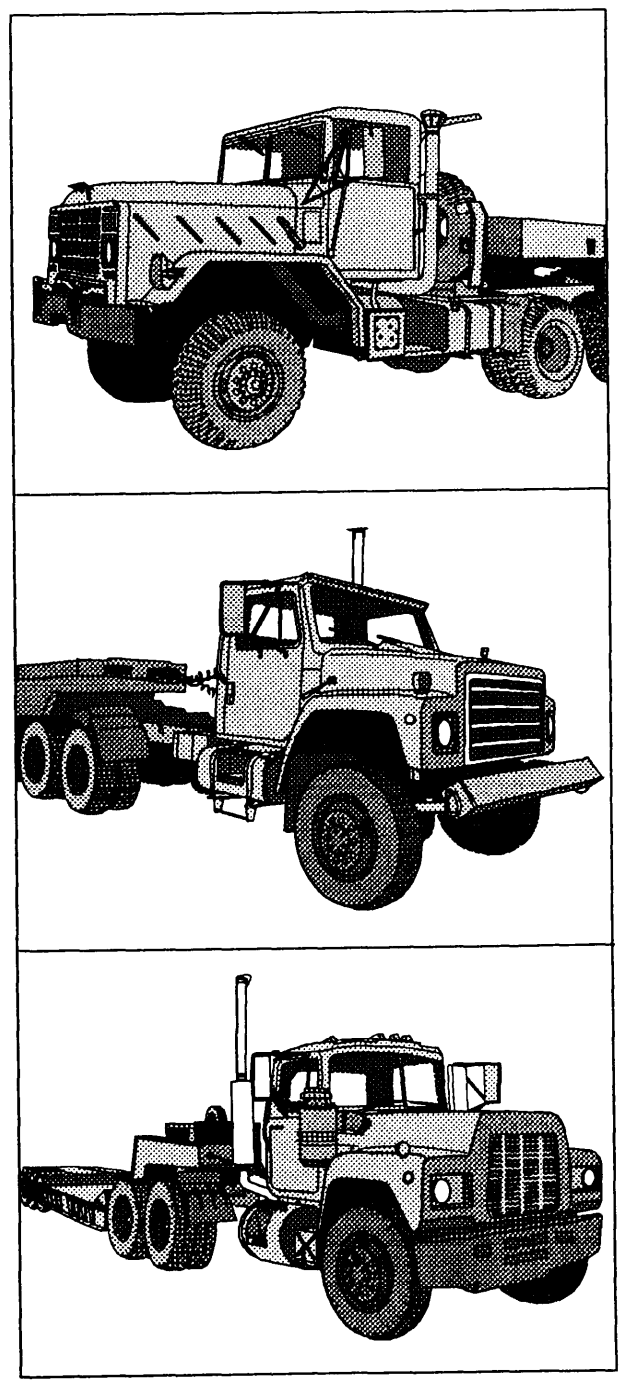


Figure 7-1.—Truck-tractors.

TYPES OF TRAILERS

The NCF uses a variety of trailers to support the mission of the NMCB. Before using any trailer, know all safety precautions, and check the manufacturer's recommendations for loading requirements, and weight restrictions. This is important because the OPERATOR IS RESPONSIBLE for the safe loading, securing, and operation of the tractor-trailer.

Van Trailer

A van trailer (fig. 7-2) is fully enclosed with permanent sides and top to keep the inside of the trailer dry and is manufactured with two basic types of doors. One type is the swing open and the other is the roll-up. In some cases, a trailer may have another door on the side. In the NCF, some of the van trailers have been modified to carry different types of cargo.

You may have to operate a refrigerated van trailer. The construction of a refrigerated van trailer is similar to the van, except it has a self-contained refrigeration unit built onto it.

Stake Trailer

The stake trailer (fig. 7-3) is often identified by the term **flatbed** and is designed for cargo that cannot fit

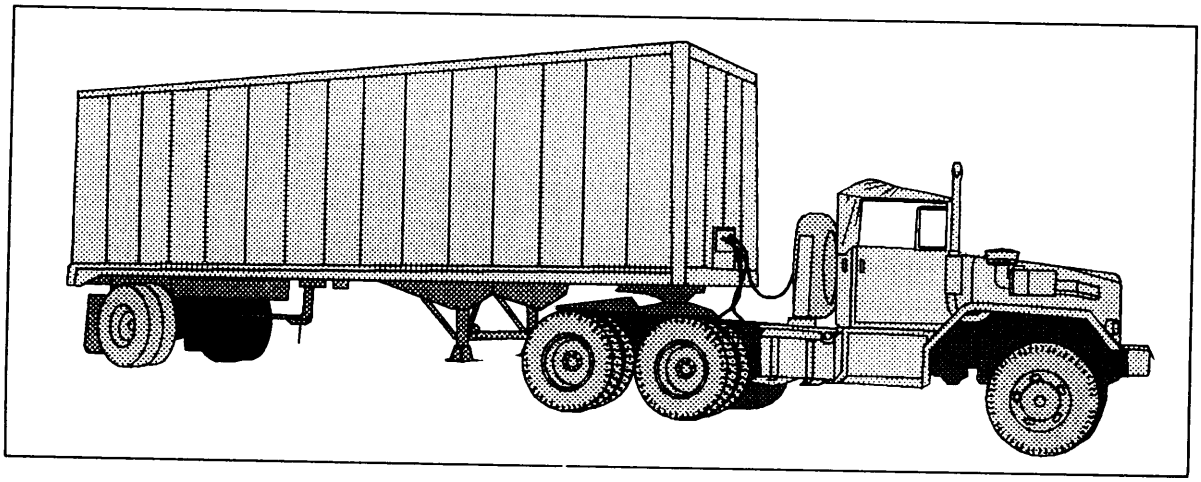


Figure 7-2.—Van trailer.

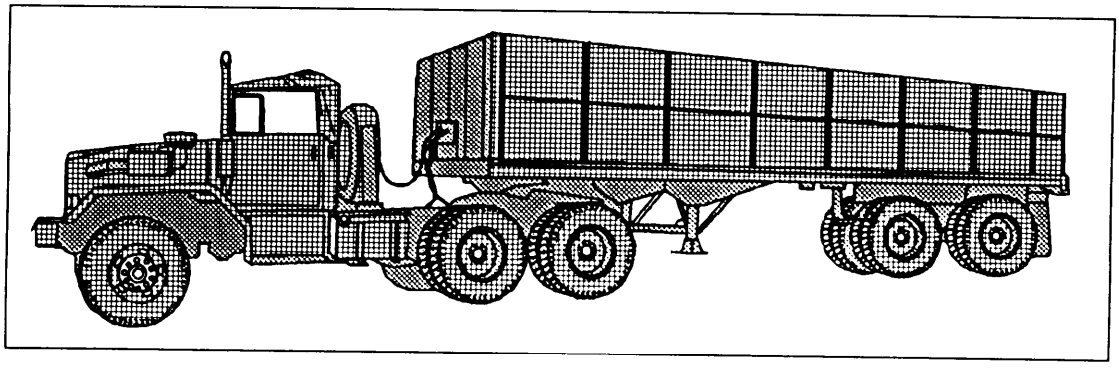


Figure 7-3.—Stake trailer.

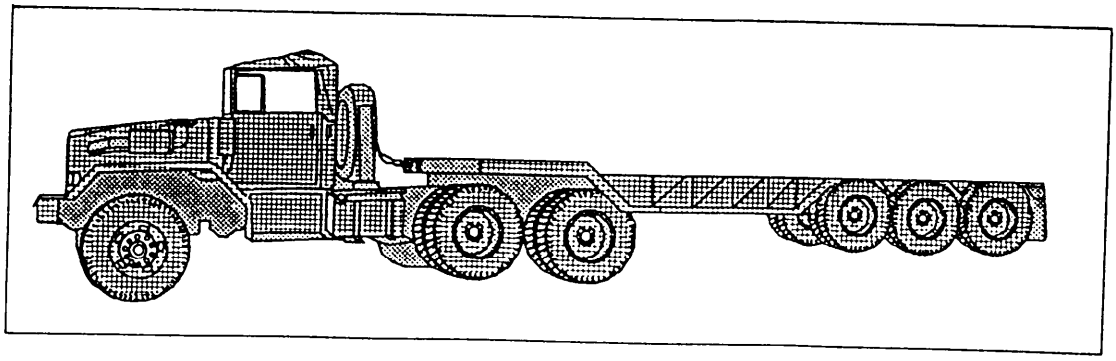


Figure 7-4.—Low-bed trailer.

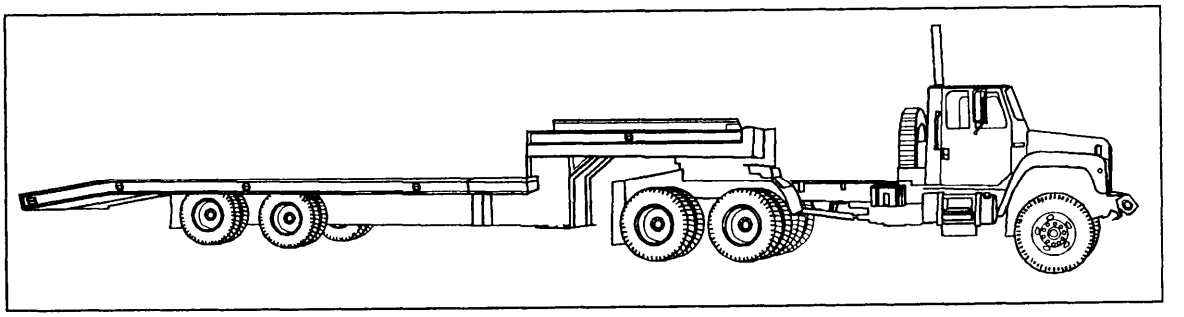


Figure 7-5.—Tilt-bed trailer.

through the doors of a van trailer. Stake trailers are easy to load and unload with forklifts from the side when the side stakes are removed. Any loads that extend over the width or length of the flatbed must be visually marked with a flag during the day and lights at night.

NOTE: Side stakes are collateral equipage for the stake trailer. The operator is responsible for the side stakes if they are removed, broken, or lost. When the side stakes are removed for storage, ensure the stakes are tagged with the USN number of the trailer. Damaged, lost, and in some cases stolen stakes should be reported immediately through your chain of command.

Low-Bed Trailer

The low-bed trailer (fig. 7-4) is often identified by the term **lowboy.** This trailer is used for hauling heavy equipment and material that is overheight and overweight for stake trailers. Low-bed trailers are heavily constructed to handle loads of 35 tons or more.

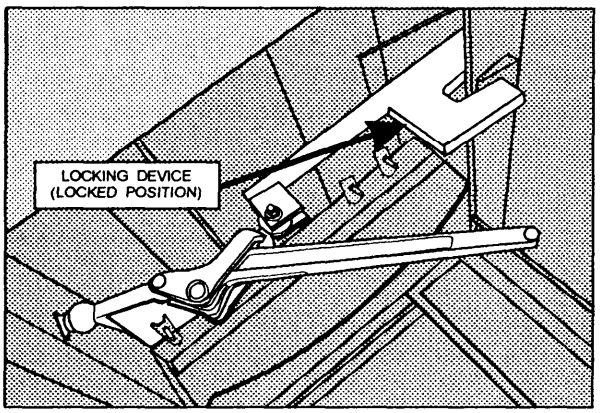
Tilt-Bed Trailer

The tilt-bed trailer (fig. 7-5) is often identified by the term **tilt-top** and is designed to tilt toward the rear for ease of loading and unloading without the use of ramps. Tilt-beds are primarily used to haul equipment; however, they also are used to transport construction materials and supplies.

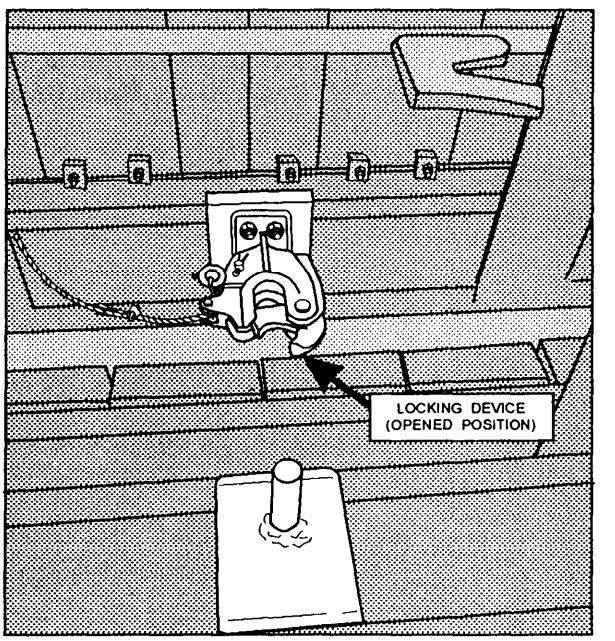
To avoid damaging equipment and trailers, you should remember the following rules:

1. Do not attempt to load heavy equipment on a tilt-bed trailer from a loading ramp or a dock.

2. Before loading heavy equipment on a tilt-bed trailer, you should ensure the locking mechanism (fig. 7-6) is fully disengaged.



PRIMARY LOCKING DEVICE
(LOCKED POSITION)



SECONDARY LOCKING DEVICE
(OPENED POSITION)

Figure 7-6.—Tilt-bed deck-locking mechanism.

3. When the tilt-bed trailer is in the tilt position, you should ensure the rear of the bed is resting on even ground.

4. Do not place heavy loads beyond the deck hinge.

5. Failure to follow the above rules can result in severe damage to the tilt-bed trailer and to the locking mechanism.

Detachable Gooseneck Trailer

The detachable gooseneck trailer (fig. 7-7) is often identified by the term **drop neck** and is designed so the gooseneck can be removed, leaving the front of the frame resting on the ground (fig. 7-8). This feature allows equipment to be loaded readily, using short ramps (usually hinged to the deck) or small blocks.

PRESTART INSPECTION

The primary reason for performing a prestart inspection is to ensure your tractor-trailer is safe. When performing your prestart inspection, you should use the same procedure each time. If you do so, you will be less likely to forget anything. A prestart inspection aid is shown in figure 7-9.

The following prestart inspection can be used as a procedure when performing prestart on all automotive equipment. All problems should be documented on the "Hard Card" NAVFAC 9-11240/13 and repaired as required. Do not operate any equip ment that does not meet safety standards. All safety features must be in operational order before any piece of equipment is used.

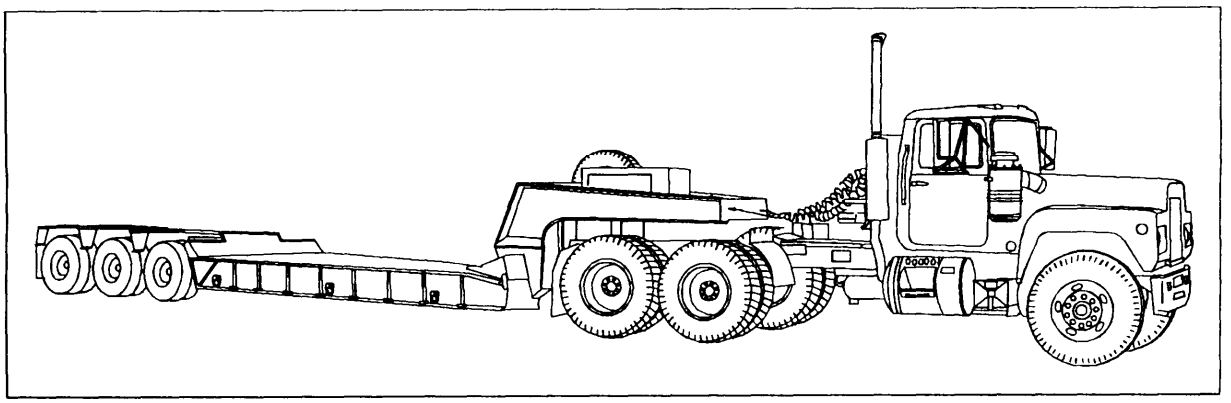


Figure 7-7.—Detachable gooseneck trailer

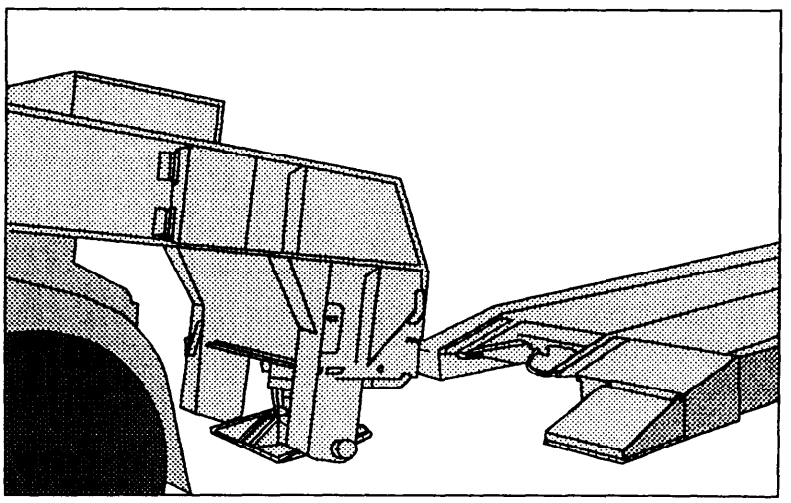


Figure 7-8.—Detached gooseneck from trailer.

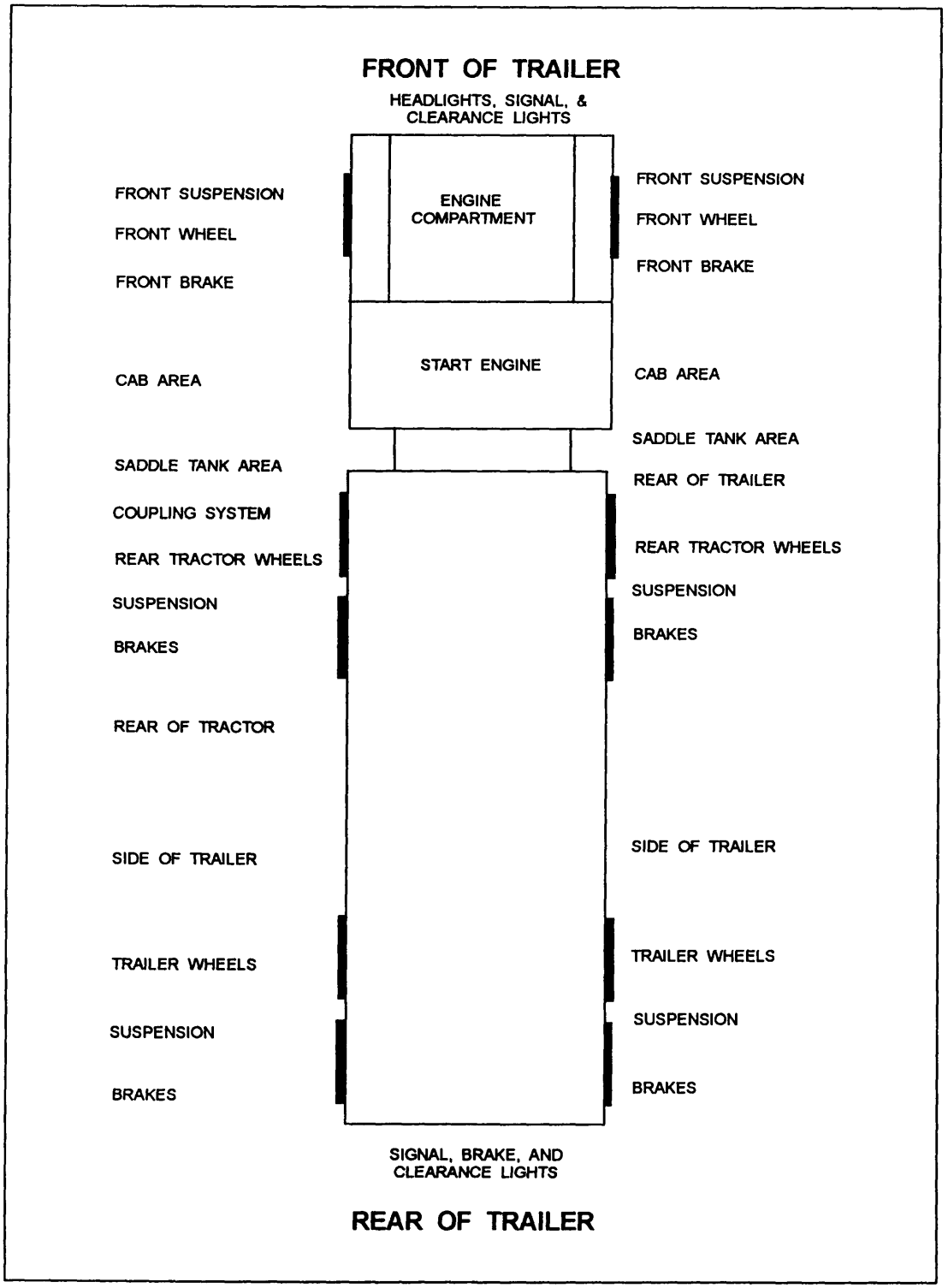


Figure 7-9.—Tractor-trailer prestart inspection aid.

Vehicle Overview

When you approach the tractor-trailer, take note of the general condition. Look for damage or if the vehicle is leaning to one side. Look under the vehicle for fresh oil, coolant, grease, or fuel leaks. You should check the area around the vehicle for people, objects, low hanging wires, and tree limbs which could present a hazard when the vehicle is moved.

Look inside the cab and ensure the parking brakes are engaged. For added safety, a set of wheel chocks should be in place around one of the tires.

NOTE: In the NCF, all 2 ton and above vehicles must have a set of wheel chocks that are used when the vehicle is parked.

Engine Compartment

You may have to raise the hood, tilt the cab (secure loose items so they cannot fall), or open the engine compartment door.

Check the following:

- Engine oil level.
- Coolant level in radiator; condition of hoses.
- Power steering fluid level; hose condition (if so equipped).
- Windshield washer fluid level.
- Battery fluid level, connection, and tiedown (batteries may be located in a separate compartment).
- Automatic transmission fluid level (may require a check with the engine warm and running).
- Check belts for tightness and excessive wear (alternator or generator, water pump, and air compressor).
- Leaks (fuel, coolant, oil, power steering fluid, hydraulic fluid, and battery fluid).
- Cracked or worn electrical wiring insulation.
- When checks are completed, you should lower and secure the hood, cab, or engine compartment door.

Walk Around Inspection

When you perform the walk around inspection, turn on the headlights, four-way hazard warning flashers, parking, clearance, side marker, and identification lights. Clean all lights, reflectors, and glass as you go along. Do not forget to check your brake and left and right turn signal lights. If a light bulb is not working, the yard boss normally has spare bulbs and tools that allows you to replace faulty bulbs.

LEFT FRONT.— On the left front of the tractor, inspect the following:

- Check the glass on the driver's door and ensure it is clean.
- Check and ensure the door latches or locks work properly.
- Check the left front wheel for the condition of the wheel and rim, such as missing, bent, broken studs, clamps, lugs, or any signs of misalignment.
- Check the condition of the tire for proper inflation, valve stem and cap are in place, serious cuts, bulges, and tread wear.
- Check the lug nuts for looseness and rust streaks.
- Check the condition of the spring, spring hanger, shackles, and U-bolts on the left front suspension.
- Check the condition of the brake drum(s) and condition of the brake hoses on the left front brake.

FRONT.— On the front of the tractor, inspect the following:

- Condition of the front axle.
- Condition of the steering system for such things as loose, worn, bent, damaged, or missing parts. Grab the steering mechanism and check for looseness.
- Condition of the windshield for damage and dirt.
- Condition of the windshield wiper arms for proper spring tension.
- Condition of the wiper blades for damage, rubber stiffness, and securement.
- Condition of lights and reflectors, such as the parking, clearance, and identification lights. Ensure they are clean, operating, and are the proper color (amber at front).

- Condition of the right turn signal. Ensure it is clean, operating, and is the proper color (amber or white on signals facing forward).

RIGHT SIDE.— On the right front, inspect all the items as you did on the left front. On the right side, inspect the following:

- Ensure the primary and safety cab locks are engaged (if cab-over design).
- Inspect the fuel tank(s) for damage, leaks, and secure mounting. Check the fuel crossover line, fuel level in the tank(s), and ensure the fuel cap(s) is/are on and secured.
- Inspect the rear of the engine for leaks.
- Inspect for leaks around the transmission.
- Ensure the exhaust system is secured and not leaking, touching wires, fuel, or air lines.
- Inspect for bends or cracks in the frame and cross members.
- Inspect air lines and electrical wiring and secure against snagging, rubbing, and wearing.
- Inspect the spare tire carrier for damage, and inspect the spare tire for proper inflation and size. Ensure the spare tire is secured in the tire carrier.

When hauling a load, inspect the following:

- Ensure the cargo is properly blocked, braced, tied, chained, and so forth.
- Ensure the header board is adequate and secured (if so equipped).
- Ensure the side racks, if equipped, are free of damage, properly set in place, and are secured.
- Ensure the canvas and tarp (if required) are properly secured to prevent tearing, billowing, or blockage of mirrors.
- Ensure all required signs are safely and properly mounted and all required permits are in your possession if the load is oversized.
- Ensure the curbside cargo door is securely closed, latched, locked, and so forth.

RIGHT REAR.— When inspecting the right rear of the vehicle, inspect the following:

- Check the condition of the wheels and rims for missing, bent, broken spacers, studs, clamps, and lugs.
- Check the condition of the tires for proper inflation, valve stem and caps, serious cuts, bulges, and tread wear.
- Ensure the tires are not rubbing against each other and that nothing is stuck between them, such as rocks, boulders, and mud.
- Ensure the tires are the same size and are not mixed, such as radial and bias types. Ensure all tires are properly inflated.
- Inspect the wheel bearings and seals for leaks.
- Check the hub oil level (if so equipped) and the hub oil reservoir for leaks.
- Inspect the suspension system, such as the condition of the springs, spring hangers, shackles, and U-bolts.
- Ensure the axle is secured and no fluid is leaking from it.
- Check the condition of the torque rod arms, bushings, and shock absorbers.
- Check the condition of the brakes, such as condition of the brake drums and undue wear on the hoses.
- Check the condition of lights and reflectors. Ensure they are clean, are operating, and are the proper color (red at rear, other amber), and that side-marker reflectors are clean and are the proper color (red at rear, others amber).

REAR.— When inspecting the rear of the vehicle, inspect the following:

- Ensure the rear clearance light, identification light, taillights and reflectors are clean, operating, and are the proper color (red at rear). Ensure that all wiring is secured in place.
- Ensure the right rear turn signal is clean, operational, and is the proper color (red, yellow, or amber at the rear).
- Ensure the license plate(s) is clean and secure (if so equipped).
- Ensure all required splash guards are present, not damaged, properly fastened, and not rubbing the tires or the ground.

When hauling a load with the vehicle, inspect the following:

- Ensure all cargo is properly blocked, braced, tied, chained, and so forth.
- Ensure the tailboards are up and properly secured (if so equipped).
- Ensure the rear doors are securely closed, latched, or locked.

LEFT SIDE.— When inspecting the left side, you inspect all items the same as on the right side, plus the following:

- Ensure the battery box (if not located in the engine compartment) is securely mounted to the vehicle.
- Ensure the battery box cover is secured.
- Ensure the batteries are secured.
- Ensure the batteries are not broken or leaking, and the fluid level in the battery is at the proper level.
- Ensure the battery cell caps are present and are securely tightened.
- Ensure the vents in the cell caps are free of foreign material.

Cab Inspection

You begin the cab inspection by ensuring the parking brake is on and the transmission is in neutral or park, if automatic. Start the engine and listen for unusual noises. Allow the engine to warmup properly. This takes between 3 to 5 minutes.

GAUGES.— Look at the gauges, such as the oil pressure, ammeter and/or voltmeter, coolant temperature, and engine oil temperature. These systems should come up to read normal within seconds after the engine has started. Warning lights and buzzers for oil, coolant, and charging system should go out once the system registers normal.

CONTROLS.— Check the condition of the following for looseness, sticking, damage, or improper setting:

- Steering wheel
- Clutch
- Accelerator pedal
- Brake controls, such as foot brakes, trailer brakes, parking brakes, and retarder controls
- Transmission controls
- Inner axle differential lock (if so equipped)
- Horn(s)
- Windshield wiper/washer
- Lights, such as headlights, dimmer switch, turn signals, four-way flashers, clearance, identification, and marker lights

MIRRORS AND WINDSHIELD.— Inspect mirrors for cracks, dirt, looseness, and obstructions. Clean, tighten, and adjust as necesary.

EMERGENCY EQUIPMENT.— Check for safety equipment, such as the following:

- Spare electrical fuses (unless the vehicle has circuit breakers)
- Three red reflective triangles
- A properly charged and rated fire extinguisher
- Tire changing equipment (obtain from collateral equipage)
- Accident reporting package

Brake Test

If your vehicle is equipped with hydraulic brakes, perform the following test to check the brake system. Pump the brakes three times, then apply firm pressure to the pedal and hold for 5 seconds. The pedal should not move. If it does, there may be a leak or other problems.

To test the parking brake, you should allow the vehicle to move forward slowly and then apply the parking brake.

To test the service braking action, you should proceed at about 5 mph, then push the brake pedal firmly. A pull of the vehicle to one side or the other or any delay in stopping action is an indication of brake trouble. Any brake problems that occurred during this testing must be documented and repaired before operating the piece of equipment.

AIR BRAKES

Air brakes use compressed air to make the brakes work. They provide a safe way to stop large vehicles when maintained and used correctly. The air brake system is composed of three combined braking systems: the service brake system, the parking brake system, and the emergency brake system.

The service brake system applies and releases the brakes when you use the brake pedal during normal driving. The parking brake system applies and releases the parking brakes when you use the parking brake control. The emergency brake system uses parts of the service and parking brake system to stop the vehicle in the event of a brake system failure.

NOTE: The components of the air brake system are covered in chapter 3.

Brake Drums, Shoes, and Linings

Brake drums are located on each end of the axles. The wheels are bolted to the drums, and the braking mechanisms are located inside the drum. The brake shoes and linings are pushed against the inside of the drum, and this action causes friction that slows the vehicle and brings it to a stop. This friction creates heat and the heat a drum can take without damage depends on how hard and how long the brakes are used. Too much heat can stop the brakes from working properly.

S-CAM AIR BRAKES.— When the air brake pedal is pushed, air is let into each brake chamber (fig. 7-10). Air pressure pushes the rod out, moving the slack adjuster, thus twisting the brake camshaft. This action turns the S-cam that forces the brake shoes away from one another and presses them against the inside of the brake drum. When the brake pedal is released, the S-cam rotates back and a spring pulls the brake shoes away from the drum, allowing the wheels to roll freely.

WEDGE BRAKES.— On wedge brakes, the brake chamber pushrod pushes a wedge directly between the ends of two brake shoes. The wedge shoves the shoes apart and against the inside of the brake drum. Wedge brakes have either a single-brake chamber or two brake chambers that push wedges into both ends of the brake shoes.

DISC BRAKES.— The air pressure in air-operated disc brakes acts on a brake chamber that produces movement of the slack adjuster, like on the S-cam brake. But instead of the S-cam, a “power screw” is used. The pressure of the brake chamber on the slack adjuster turns the power screw. The power screw clamps the disc or rotor between the brake lining pads of a caliper.

NOTE: Wedge and disc air brakes are less common than the S-cam brake.

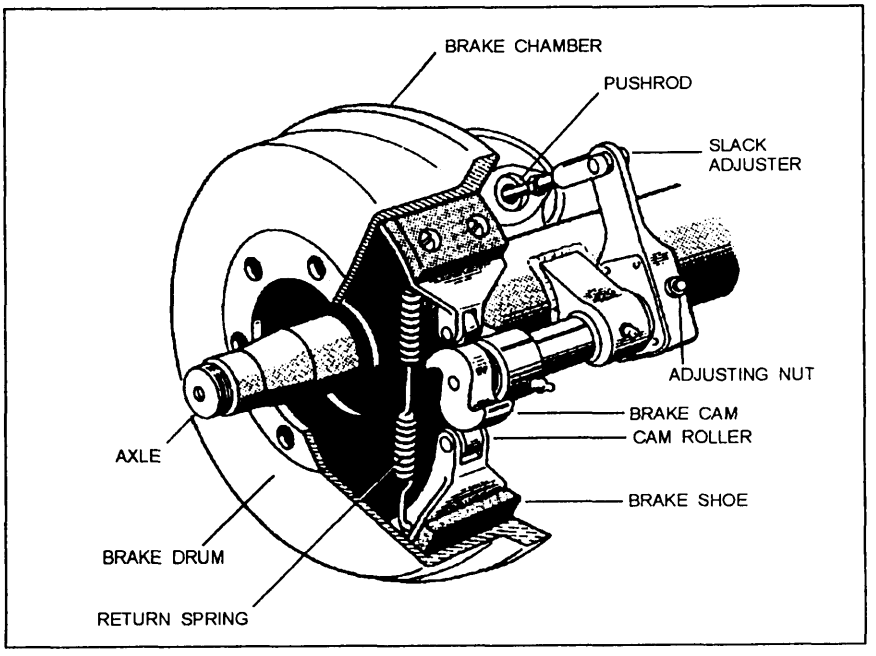


Figure 7-10.—S-cam air brake.

Spring Brakes

All trucks, tractor-trailers, and buses are equipped with emergency and parking brakes. These brakes are applied by the mechanical force produced by a spring brake. When you are driving, the powerful springs are held back by air pressure. A leak in the air pressure system causes the springs to engage the brakes. Engaging the parking brake control on the dashboard releases the air holding back the springs. This action allows the springs to engage the brakes.

Tractor and straight truck spring brakes engage when the air pressure drops to a pressure ranging between 20 to 45 psi. Do not wait for the brakes to engage automatically. When the low air pressure warning light and buzzer activates, you should bring the vehicle to a safe stop immediately, while you can still control the brakes.

The braking power of the spring brakes depends on the adjustment of the brakes. If the brake adjustment is incorrect, the regular, emergency, and parking brakes cannot work correctly.

Parking Brake Controls

On newer vehicles, a diamond shaped, yellow, push-pull control knob is used to engage or disengage the parking brakes. When the knob is pulled out, the brakes are engaged. By pushing the knob in, you can release the brakes. On older vehicles, the parking brake may be controlled by a lever. You should engage the parking brake anytime the vehicle is parked.

Using Air Brakes

When using air brakes, you should push the brake pedal down and control the pressure so the vehicle comes to a smooth, safe stop. If your vehicle is equipped with a manual transmission, do not push the clutch in until the engine rpm is lowered to idle speed. When stopped, select a starting gear.

EMERGENCY STOPS.— When applying air brakes in an emergency stop, brake so you can steer and keep your vehicle in a straight line. Use methods of controlled or stab braking.

Controlled Braking.— Controlled braking is also called “squeeze” braking. Controlled braking is applying the brakes as hard as possible without locking the wheels. Do not turn the steering wheel while doing this. If steering is required or the wheels begin to slide, release the brakes. Brake again as soon as the tires gain traction.

Stab Braking.—The stab braking method requires applying the brakes as hard as possible and releasing them when the wheels lock up. As soon as the wheels start to roll, apply the brakes fully again. It can take up to 1 second for the wheels to start rolling after releasing the brakes. You should stay off the brakes long enough to get the wheels rolling again; otherwise, the vehicle may not stay in a straight line.

DOWNHILL BRAKING.— The correct method for going down long grades is to use a low gear and travel at a slow speed that allows a fairly light, steady use of the brakes to prevent the vehicle from speeding up. When you go slow and apply light pressure, the brakes cool down and work properly.

CAUTION

When going down a hill, overuse of the brakes can make them get too hot which causes the brakes to fade. This can cause the operator to press down harder on the pedal to gain the required braking power. Prolonged action like this can cause the brakes to fade until they stop working.

Trailer Hand Valve

The trailer hand valve (also called the trolley valve) controls the trailer brakes. Do not use it when driving because of the danger of making the trailer skid. The foot brake sends air to all of the brakes on the vehicle, including the trailer. There is much less danger of causing a skid or jackknife when only the foot brake is used.

Tractor Protection Valve

The tractor protection valve keeps air in the tractor or truck should the trailer break away or develop a bad air leak. The valve is controlled by the **trailer air supply** control valve in the cab of the tractor or truck. The control valve allows the opening and shutting of the tractor protection valve. The tractor protection valve closes automatically when the air pressure drops to a range of 20 to 45 psi. When the tractor protection valve closes, it stops any air from escaping from the tractor. It also shuts off the air from the trailer emergency line, causing the trailer emergency brakes to engage.

Trailer Air Lines

Every combination vehicle has two air lines. These lines are the service line and the emergency line. They run between each vehicle, such as tractor to trailer, trailer to dolly, and dolly to second trailer.

SERVICE AIR LINES.— The service line carries air that is controlled by the foot brake or the trailer hand brake. Depending on how hard the foot brake is engaged, the pressure in the service line will similarly change. The service line is connected to relay valve(s) on the trailer to apply more or less pressure to the trailer brakes. As pressure increases in the service line, the relay valve opens and sends air pressure from the trailer air tanks to the trailer brake chambers, thus applying the trailer brakes.

EMERGENCY AIR LINES.— The emergency line has two purposes. First, it supplies air to the trailer air tanks. Second, the emergency line controls the emergency brakes on the combination vehicle. Loss of air pressure in the emergency line causes the trailer emergency brakes to activate. The pressure loss could be caused by a trailer breaking loose and tearing apart the emergency air hose. The loss could also be the result of a hose, metal tubing, or other parts breaking and causing an air leak. When the emergency line loses pressure, it also causes the tractor protection valve to close, causing the air supply knob to pop out.

Emergency lines such as hoses couplers, and other parts, have a red covering. The red covering allows you to separate the emergency lines from the service lines which have a blue covering.

Hose Couplers

Hose couplers, commonly known as **glad hands** (fig. 7-11), are coupling devices used to connect the service and emergency air lines from the truck or tractor to the trailer. The glad hands have rubber seals, known as rubber grommets, that prevent the air from escaping. Clean the rubber grommets before you connect the glad hands. When connecting the glad hands, press the two seals together with the glad hands at a 90-degree angle to each other. A turn of the glad hands attached to the hose joins and locks the couplers.

Some vehicles have “dead end” or dummy glad hands to which the hoses should be connected when not in use. This prevents water and dirt from getting into the glad hands and the air lines. This is very important because keeping the air system clean is a critical factor.

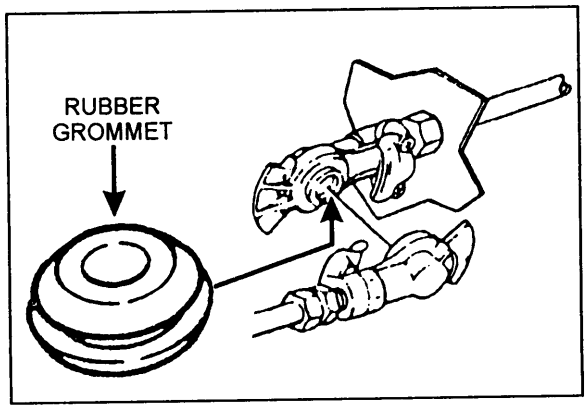


Figure 7-11.—Glad hands.

When connecting the glad hands, ensure the proper glad hands are coupled together. On some equipment, metal tags are attached to the lines with the words **service** and **emergency** stamped on them. The color blue is used for the **service line** and the color **red** for the **emergency** line connections.

If the air lines are crossed, supply air is sent to the service line instead of going to charge the trailer air tanks; therefore, air is not available to release the trailer spring brakes (parking brakes). If the spring brakes do not release when you push the trailer air supply control knob, check the air line connections.

CAUTION

Older trailers do not have spring brakes. If the air supply in the trailer air tanks has leaked out, emergency brakes will not exist, and the trailer wheels will turn freely. If you cross the air lines, the trailer will roll; however, there will be no trailer brakes.

NOTE: Always test the trailer brakes before driving by engaging the hand valve or by pulling the tractor protection valve. Once these brakes are engaged, shift the tractor to low gear and pull **gently** against the brake system to make sure the brakes work.

Shutoff Valves

Shutoff valves, commonly known as cutoff cocks, are used in the service and emergency lines glad hands located on the back of military series tractors, cargo

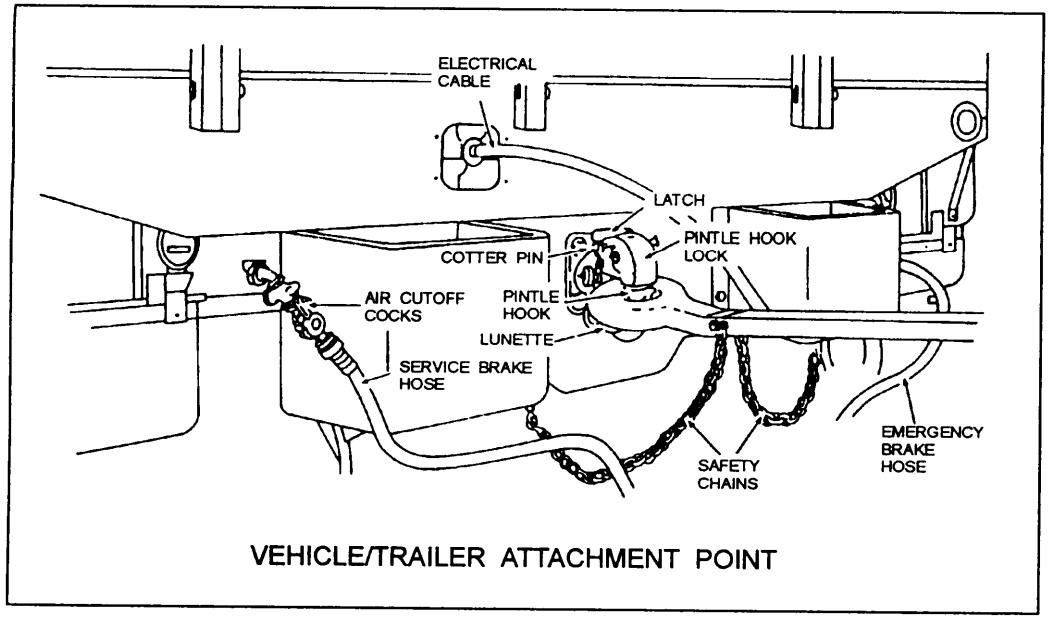


Figure 7-12.—Vehicle trailer hookup with glad hand cutoff cock.

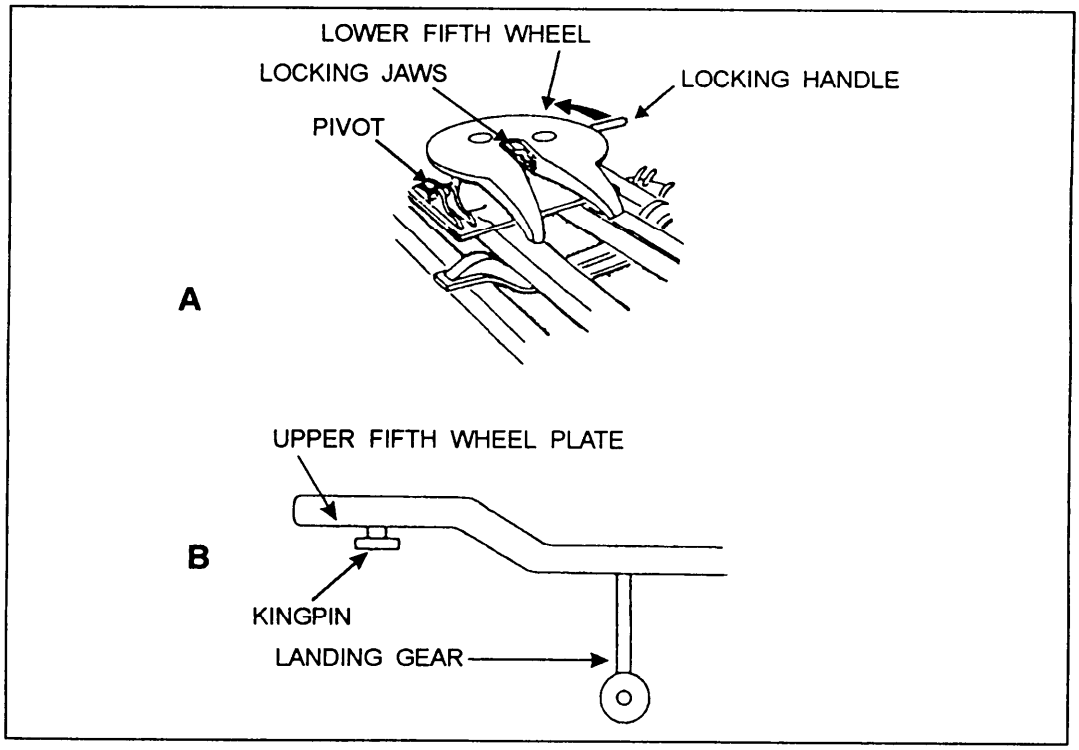


Figure 7-13.—Fifth wheel assembly.

trucks, and trailers (fig. 7-12). These valves permit the opening and closing of the airlines when towing trailers.

Trailer Air Tanks

Trailers and dollies have one or more air tanks. The air tanks are filled by the **emergency air line** from the tractor. They provide the air pressure used to operate the trailer brakes by sending air pressure from the air tanks to the brakes via relay valves. The pressure in the **service line** signals how much pressure the relay valves should send to the trailer brakes. The pressure in the service line is controlled by the brake pedal and/or the trailer hand brake.

CAUTION

Do not allow water and oil to build up in the air tanks. Excessive amounts of water and oil affect the operation of the brakes negatively. Each tank has drain valve that should be drained daily.

OPERATION

In the NCF, tractor-trailer operations are managed by the transportation supervisor. The operation of a tractor-trailer is much more difficult than that for most other vehicles; therefore, operators must be mature, reliable, and experienced.

To drive a tractor-trailer safely, you must be able to control its speed and direction. Safe operation of a tractor-trailer requires skill in coupling and uncoupling, accelerating, steering, shifting gears, and braking. Additionally, you must remember to make allowances for the added length when turning, backing, and passing other vehicles and for maneuvering into position for loading and unloading.

Fifth Wheel Assembly

A tractor and trailer are separate units joined together by a fifth wheel. The fifth wheel consists of two metal plates: one on the tractor, known as the **lower fifth wheel** (fig. 7-13, view A), and one on the trailer, known as the **upper fifth wheel** (fig. 7-13, view B).

The upper and lower fifth wheel form a flexible coupling that permits both rotational and vertical movement between the tractor and trailer. The upper fifth wheel has a **kingpin** and the lower fifth wheel has **locking jaws** that lock around the kingpin to couple the tractor-trailer together. The locking jaws is operated by a hand lever that extends to the side of the lower fifth wheel and can be released by either pulling the locking handle forward, as shown in figure 7-13, or pulling the locking handle outward, as shown in figure 7-14.

When the trailer is not connected to the tractor, the front end of the trailer is supported by a retractable two-legged landing gear. The landing gear may be equipped with either wheels or pads (flat pieces of heavy metal). The glad hand connections for the service and emergency air lines and the electrical connection for the clearance, side marker, and brake lights are located on

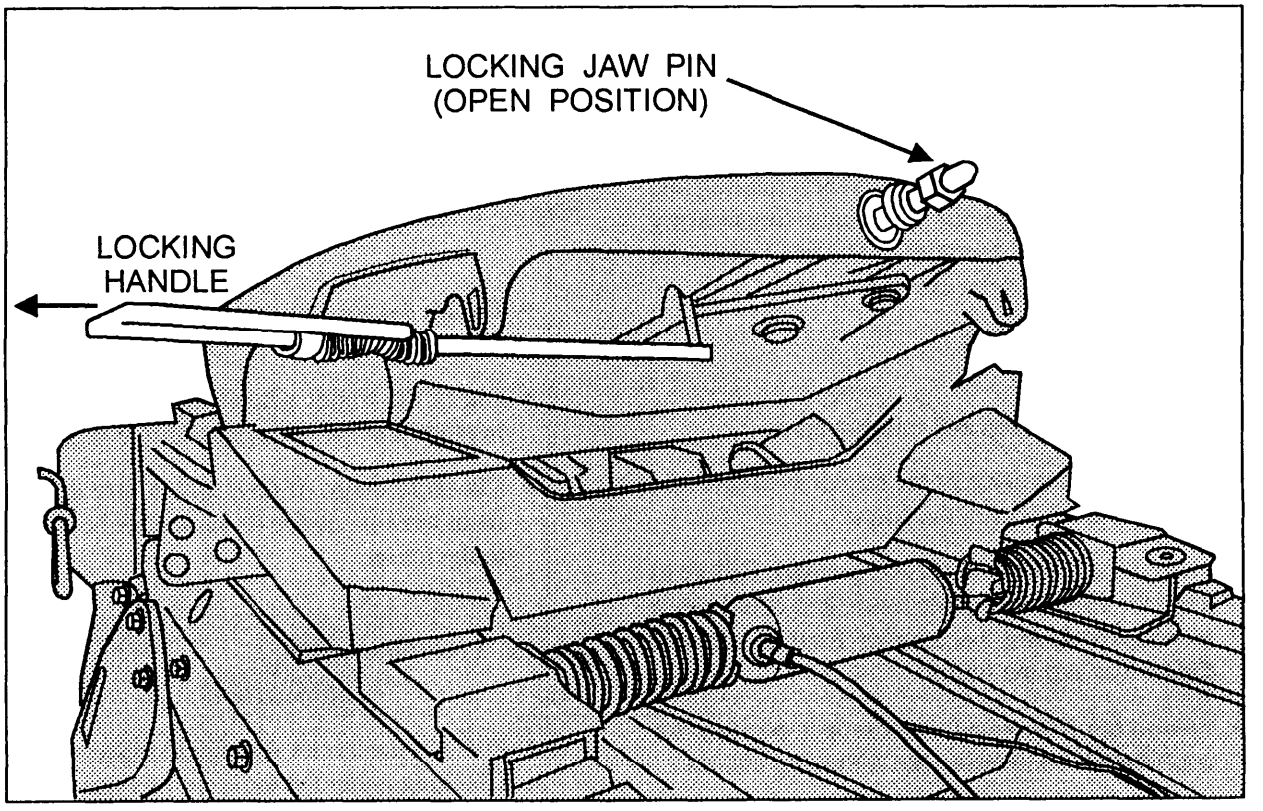


Figure 7-14.—Fifth wheel locking jaws in open position.

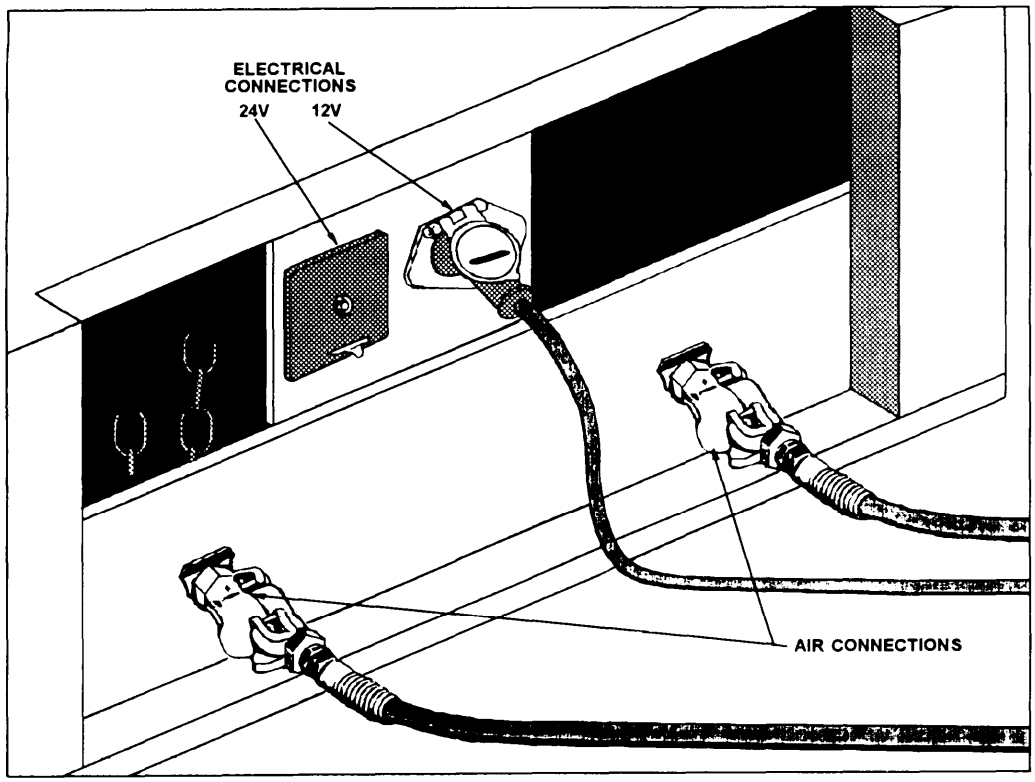


Figure 7-15.—Air and electrical connections.

the front of the trailer (fig. 7-15). Trailers in the NCF normally have two electrical connections adaptable for either a 12- or 24-volt electrical system.

Coupling and Uncoupling

Coupling and uncoupling correctly is basic to the safe operation of tractor-trailers. Incorrect coupling and uncoupling can be dangerous and cause unnecessary equipment damage and downtime. The basic steps for coupling a tractor to a trailer are as follows:

Step 1. Inspect fifth wheel

- Check for damaged and missing parts.
- Ensure the mounting to the tractor is secure and there are no cracks in the frame.
- Ensure the fifth wheel plate is greased. Failure to keep the fifth wheel plate lubricated could cause steering problems because of friction between the tractor and the trailer.
- Ensure the fifth wheel is in proper position for coupling by completing the following checks:
  1. Ensure the wheel is tilted down towards the rear of the tractor.
  2. Ensure the locking jaws are open.
  3. If equipped with a sliding fifth wheel assembly, ensure it is locked in position.
  4. Ensure the trailer kingpin is not bent or broken.

Step 2. Inspect area and chock wheels

- Ensure the area around the tractor and trailer are clear of obstacles.
- Check the trailer wheels and ensure chocks are in place and the spring brakes are engaged.
- Check all cargo (if any) and ensure it is secured from movement due to the tractor being coupled to the trailer.

Step 3. Position tractor

Position the tractor directly in front of the trailer. (Backing under the trailer at an angle could push the trailer sideways and bend or break the landing gear.)

- Check the position of the tractor by using both outside mirrors and by looking down both sides of the trailer.

Step 4. Back slowly

- Back slowly until the fifth wheel just touches the trailer.

Step 5. Secure tractor

- Apply the parking brake.
- Place the manual transmission in neutral; if an automatic transmission, place in park.
- Place wheel chocks.

Step 6. Check height of trailer

- The trailer should be low enough to allow it to be raised slightly by the tractor when the tractor is backed under it. Raise or lower the trailer as needed.

CAUTION

If the trailer is too low, the tractor may strike and cause unnecessary damage to both the rear of the tractor and the nose of the trailer. If the trailer is too high, it may not couple correctly.

- Ensure the kingpin and fifth wheel are aligned.

Step 7. Connect air lines to trailer

- Inspect rubber grommets in the glad hands for wear and tear.
- Connect the tractor emergency air line to the trailer emergency glad hands.
- Connect the tractor service air line to the trailer service glad hands.
- Ensure air lines are safely supported so they cannot be crushed or caught while the tractor is backing under the trailer.

Step 8. Supply air to trailer

- From the cab, push in the "air supply" knob to supply air to the trailer brake system. Military tractors are sometimes equipped with shutoff valves that must be opened to supply air to the trailer brake system.
- Check the air pressure gauge and wait until the air pressure is normal.
- Apply and release trailer brakes, listen for the sound of the trailer brakes being applied and released. You should hear the brakes move when applied and air escape when the brakes are released.
- Check the air pressure gauge for signs of major air loss.

Step 9. Lock trailer brakes

- Pull out the "air supply" knob or apply the trailer hand valve on the steering column to lock the trailer brakes.

Step 10. Back under the trailer

- Use the lowest reverse gear.
- Back the tractor under the trailer until the kingpin is locked into the fifth wheel.
- Pull the tractor gently forward while the trailer brakes are still engaged ensuring the trailer kingpin is locked into the locking jaws of the fifth wheel.

Step 11. Inspect coupling

- Place the transmission in neutral, if manual; in park, if an automatic transmission.
- Engage parking brakes.
- Disengage the trailer hand valve.

NOTE: Depending on your location, you may want to shut off the engine and take the key with you to prevent someone from moving the truck while you are under it.

- Inspect the area around the fifth wheel. Make sure there is no gap between the upper and lower fifth wheel. If there is a gap, something is wrong. The kingpin may be on top of the closed locking jaws; if so, the trailer can come loose easily.

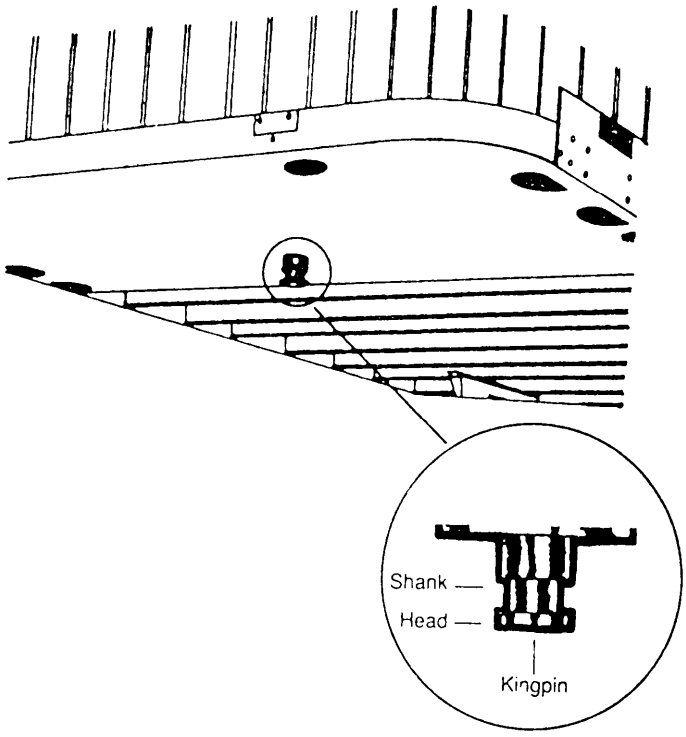


Figure 7-16.—Trailer kingpin.

- Go under the trailer and look into the back of the fifth wheel. Ensure the fifth wheel locking jaws have closed around the shank of the kingpin (fig. 7-16).
- Check that the locking lever pin is in the "lock" position (fig. 7-17).
- Ensure the safety catch is in position over the locking lever pin (if so equipped).

Step 12. Connect the electrical cord and check air lines

- Plug the electrical cord into the trailer (fig. 7-18) and fasten the safety catch.
- Inspect both air lines and electrical lines for signs of damage.
- Ensure air and electrical lines do not contact any moving parts of the vehicle.

Step 13. Raise landing gear

- Use the low gear (if so equipped) to begin raising the landing gear. Once free of weight, switch to the high gear range.
- Raise the landing gear all the way up. Driving with the landing gear part way up is not a good practice because it may catch on railroad tracks or other obstacles.
- Secure the crank handle safely after the landing gear is raised.

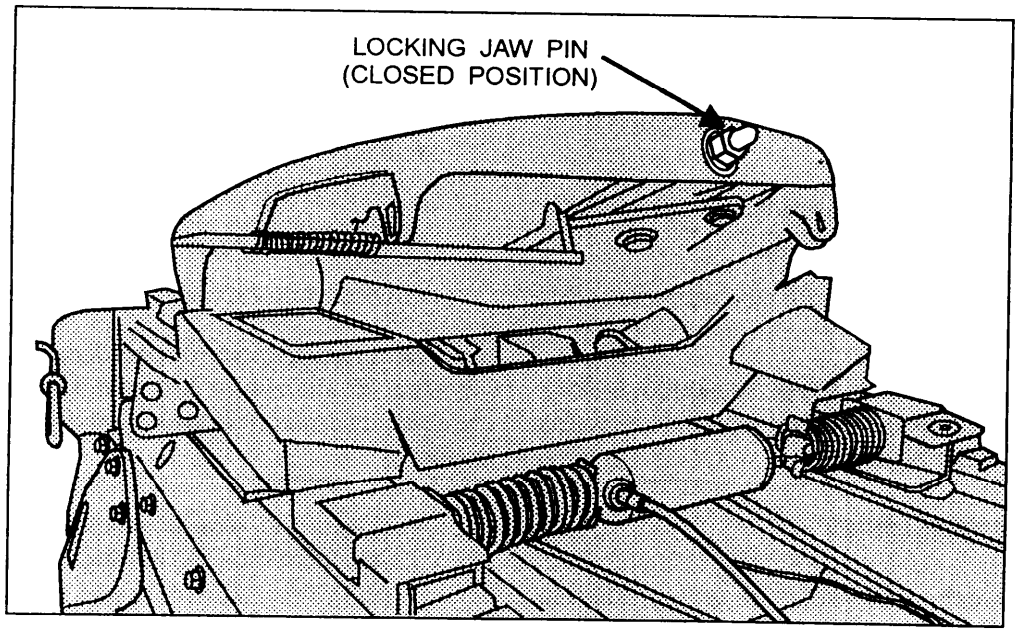


Figure 7-17.—Locked fifth wheel.

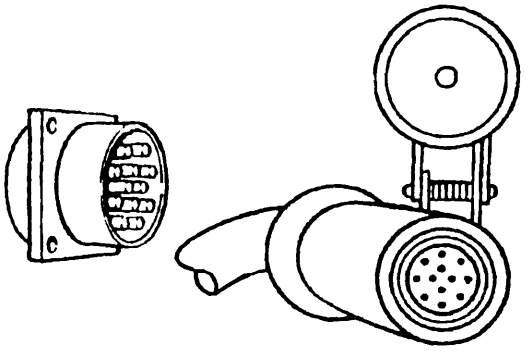


Figure 7-18.—Electrical connector.

- Check the rear of the tractor frame and the landing gear for enough clearance to make turns.
- Ensure there is enough clearance between the top of the tractor tires and the nose of the trailer.

Step 14. Remove trailer wheel chocks

- Remove and store wheel chocks in a safe place.

The basic steps for uncoupling a tractor from a trailer are as follows:

Step 1. Position tractor and trailer

- Ensure the parking area surface can support the weight of the trailer.
- Ensure the tractor is lined up with the trailer, if at all possible, because pulling out at an angle can bend and damage the landing gear.

Step 2. Ease pressure on locking jaws

- Shut off trailer air supply or engage the trailer hand valve to lock the trailer brakes.
- Ease pressure on the locking jaws by backing up gently. (This procedure helps you release the fifth wheel locking lever.)
- Apply the parking brakes while the tractor is backing; this holds the tractor in place with the pressure of the kingpin off the locking jaws.

Step 3. Lower the landing gear

- Chock the trailer wheels.
- If the trailer is empty: lower the landing gear until it makes firm contact with the ground.
- If the trailer is loaded: after the landing gear makes firm contact with the ground, turn the crank in low gear a few extra turns; this lifts some weight off the tractor suspension.

NOTE: Do not lower the landing gear so low that it lifts the trailer off the fifth wheel because doing this makes it harder to couple and uncouple.

Step 4. Disconnect electrical cable

- Disconnect the electrical cable and hang the cable with the plug down to prevent moisture from entering it.
- Ensure the electrical cable is supported so it will not be damaged while driving the tractor.

Step 5. Unlock fifth wheel

- Raise the safety catch over the locking pin (if so equipped).
- Pull the release handle to the “open” position.

WARNING

Keep legs and feet clear of the rear of the tractor wheels to avoid injury should the tractor move.

Step 6. Pull tractor partially clear of trailer

- Pull tractor forward until the fifth wheel comes out from under the trailer.
- Stop with the tractor frame underneath the trailer. This prevents the trailer from falling to the ground if the landing gear should collapse or sink.

Step 7. Secure tractor

- Apply the parking brake.
- Disengage the trailer hand valve to release trailer brakes.
- Place the manual transmission in neutral; in park, if an automatic transmission.

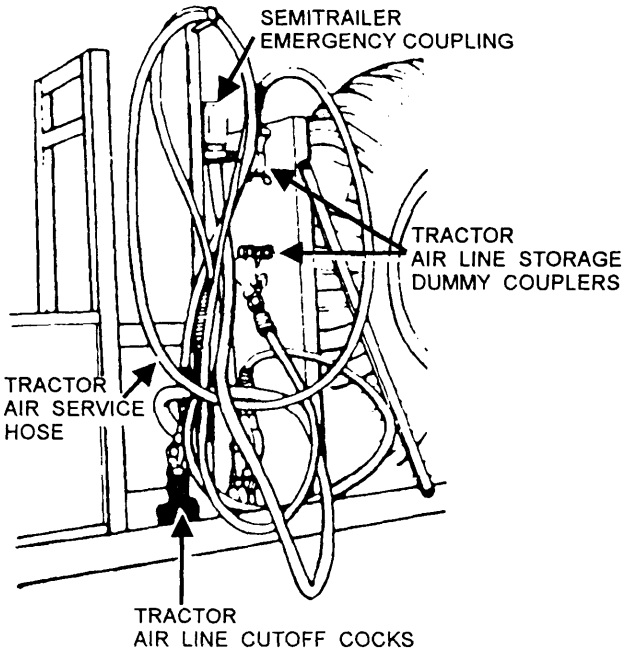


Figure 7-19.—Air line storage dummy couplers.

Step 8. Secure trailer

- Disconnect the air lines from the trailer. Connect the air line glad hands to dummy couplers at the back of the tractor cab (fig. 7-19).
- Ensure the lines are supported so they will not be damaged while driving the tractor.
- Ensure the ground is supporting the trailer.
- Ensure the landing gear is not damaged.

Step 9. Pull the tractor clear of trailer

- Release the parking brakes.
- Check the surrounding area and drive the tractor clear of the trailer.

Accelerating

When driving a tractor-trailer, you must not roll backward when you start, because you may hit a vehicle behind you. Partly engage the clutch before taking your right foot off the brake. If on an incline, engage the parking brake to hold the tractor, then release the parking brake only when you have applied enough engine rpm to keep from rolling backward. Another technique is to engage the engine hand throttle to increase the engine rpm while your right foot is on the brake and your left foot is partly engaging the clutch. As the clutch engages, release the foot brake, and disengage the engine hand throttle.

Accelerate smoothly and gradually so the tractor does not jerk. Rough acceleration causes unnecessary premature mechanical damage to the drive train and to the coupling. When traction is poor as in rain or snow, speed up gradually. Using too much power may cause the drive wheel to spin. If the drive wheels lose traction, do not apply the brakes; just take your foot off the accelerator pedal.

Steering

When steering, hold the steering wheel firmly with both hands on the opposite sides of the wheel. Should you hit a pothole or a curb, the steering wheel could pull away from your hands if you do not have a firm hold.

Shifting Gears

Correct shifting of gears is important. Not only must you have full control of your tractor-trailer, but "grinding to find them," a term used when a driver forces the gears to engage, clutch slipping, rapid engagement during shifting, improper downshifting, and so forth, causes premature failure of drive-line components.

Most tractor-trailers with manual transmissions require double clutching to change gears. The procedures for double clutching were covered in chapter 2. Remember: Shifting gears using double clutching requires practice. If you remain too long in neutral, you may have difficulty putting the transmission into the next gear. If this happens, do not try to force it. Instead, return to neutral, release the clutch, increase engine speed to match the road speed, and try to shift into the correct gear.

You can use two factors to tell when to shift the transmission. One is the engine rpm. The operator's manual tells you the operating rpm range for the tractor. Using the tachometer, shift up when the engine reaches the top of the range. The second factor is the road speed (mph). Through experience you will learn what speeds each gear is good for. Then by using the speedometer or engine sound, you will know when to shift.

MULTI-SPEED REAR AXLES AND AUXILIARY TRANSMISSIONS.— Multi-speed rear axles and auxiliary transmissions are used on many tractors to provide extra gears. These gears are shifted by a selector knob or switch on the gearshift lever of the main transmission. Many different transmission shifting patterns are used; therefore, it is **important** that the operator study the operator's manual before operating a tractor with an unfamiliar transmission shifting pattern.

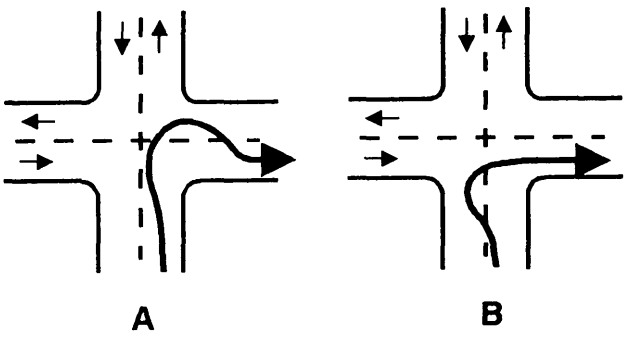


Figure 7-20.—Right turn.

AUTOMATIC TRANSMISSIONS.— Some tractors in the NCF are equipped with automatic transmissions. A low range can be selected to have a greater engine braking power when going down grades. The lower ranges prevent the transmission from shifting up beyond the selected gears. Shifting an automatic transmission incorrectly can cause serious damage to the transmission; therefore, operators must study the operator's manual for techniques of shifting automatic transmission.

RETARDERS.— Some tractors are equipped with a retarder that helps slow a vehicle, reducing the need for using the brakes. One common retarder is known as the "jake brake." Retarders reduce brake wear and provide another means to slow down. Retarders are controlled by the operator and are either exhaust, engine, hydraulic, or electric.

Turns

When making turns with the tractor-trailer, you must allow for the overall length of the unit. Remember: The tractor-trailer is hinged in the middle, and the trailer has a tendency to cut the corners, rather than follow the tractor. For this reason, it is necessary to make a wider turn than when turning with a straight truck.

CAUTION

Turning turn signals on well in advance of starting the turn is extremely important. This action warns other drivers that a turn is going to be made and allows them to drive safely.

RIGHT TURNS.— When performing a right-hand turn, turn slowly to give yourself and others time to avoid problems. If you cannot make the right turn without swinging into another lane, turn wide as you complete the turn, as shown in figure 7-20, view A. Keep the rear of the tractor-trailer close to the curb to stop any drivers from passing on the right. If you must cross into the oncoming traffic lane when making your turn, watch for vehicles coming towards you. Give them room to go by or stop; however, do not back up for them, because you may have a vehicle directly behind you.

Do not turn wide to the left as you start the turn to the right, as shown in figure 7-20, view B, because a following driver may think you are turning left and try to pass you on the right. Remember: If you turn too sharp while making a right turn, your trailer will ride up the curb and possibly run over obstructions (fig. 7-21).

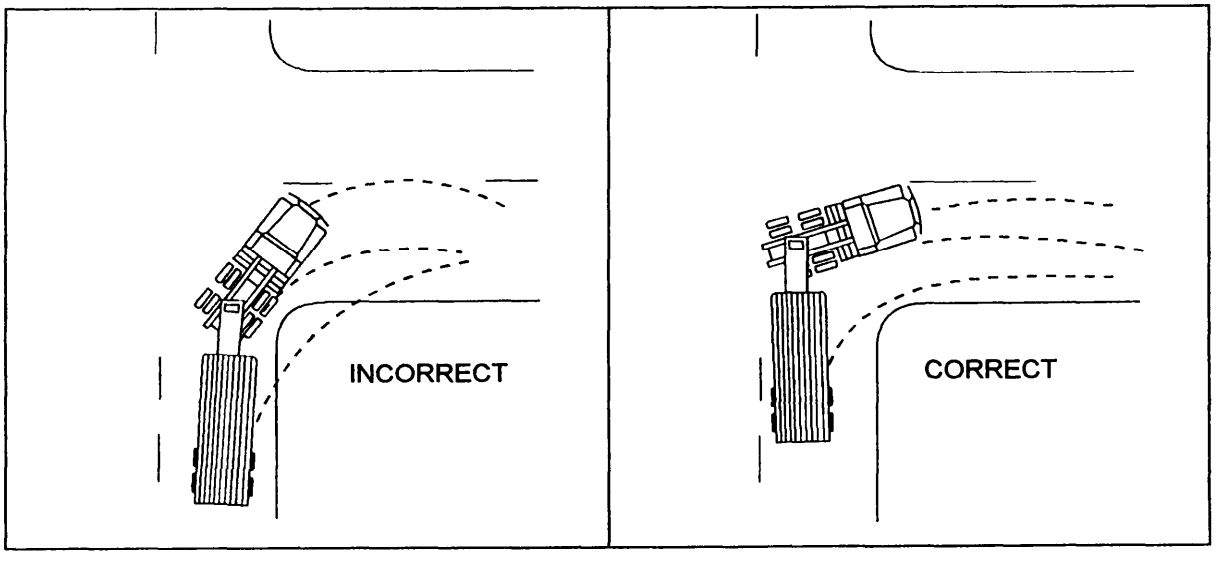


Figure 7-21.—Incorrect right turn.

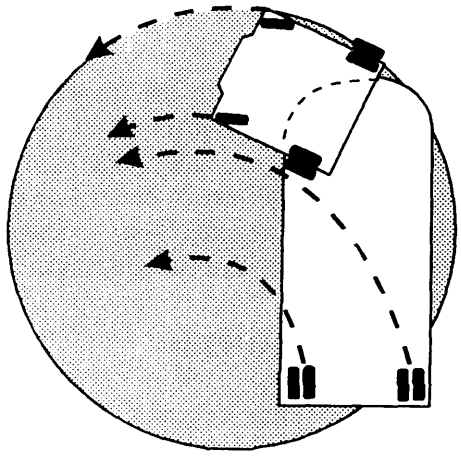


Figure 7-22.—Tractor-trailer left turn off tracking.

LEFT TURNS.— On a left turn, ensure you have reached the center of the intersection before you start the left turn. If you turn too soon, the left side of your vehicle may hit another vehicle because of off tracking (fig. 7-22).

If there are two turning lanes, always take the right-hand turn lane, as shown in figure 7-23. Do not start in the inside lane because you may have to swing right to make the left turn. You may not see vehicles on the right and cause a collision.

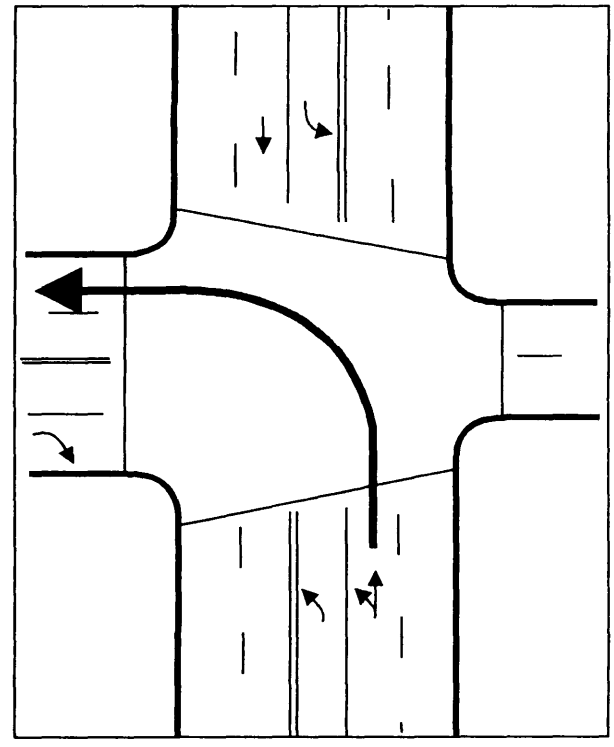


Figure 7-23.—Left turn from right-hand lane.

Backing

When backing a tractor-trailer, reverse the procedure you would use to back a bus or a straight truck; for example, if you want the trailer to go to the left, turn the steering wheel to the right. After the trailer is headed in the desired direction, turn the steering wheel slowly to the left. This puts the tractor in the same line of travel as the trailer and prevents the tractor and trailer from jackknifing. (The term *jackknifing* means a condition where the tractor and trailer are jammed together at an acute angle.)

Backing the trailer to the left is known as **sight-side** backing because you have a better view of the area into which you are backing, as shown in figure 7-24, view A. Sight-side backing is the recommended method for backing.

Reverse the sight-side backing procedures to back a trailer to the right. This is known as **blind-side** backing and should be done only when it is absolutely necessary. As shown in figure 7-24, view B, as the driver, you cannot see the rear of your trailer or the area into which you are backing.

CAUTION

You should always use a backing guide when performing backing operations with a tractor-trailer.

SAFETY

When pulled off the road with a tractor-trailer, turn on the four-way emergency flashers. However, do not trust taillights to provide a warning because drivers have crashed into the rear of parked vehicles because they thought it was moving. If you must stop on a road or on a shoulder, you should place reflective triangles within as soon as possible. The reflective triangles are placed at the following locations:

1. On a two lane or undivided highway, place reflective triangles on the traffic side of the vehicle within 10 feet of the front or rear corners. This marks the location of the vehicle. Additionally, place reflective triangles about 100 feet behind and ahead of the

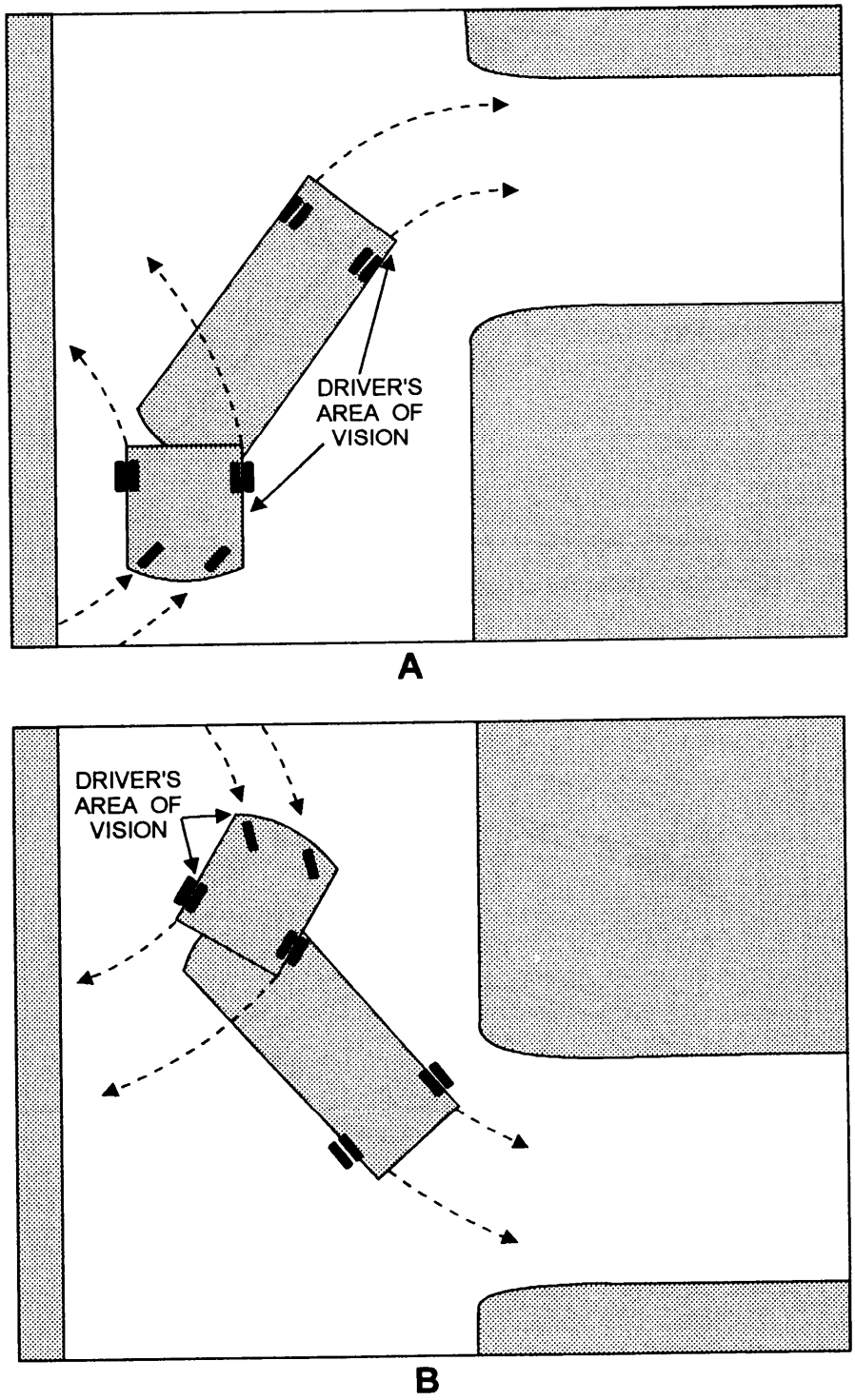


Figure 7-24.—Backing a tractor-trailer.

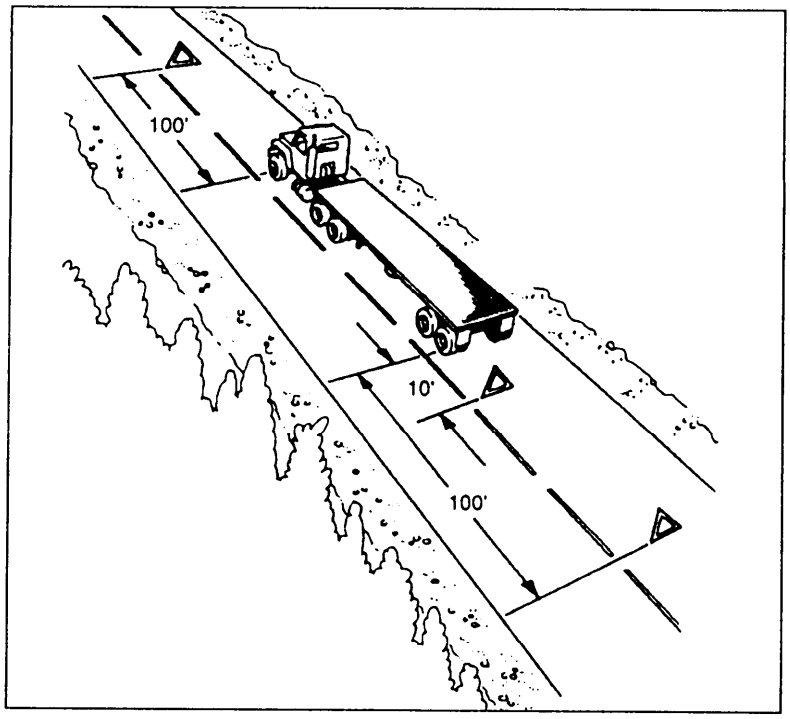


Figure 7-25.—Reflective triangle placement: two lane or undivided highway.

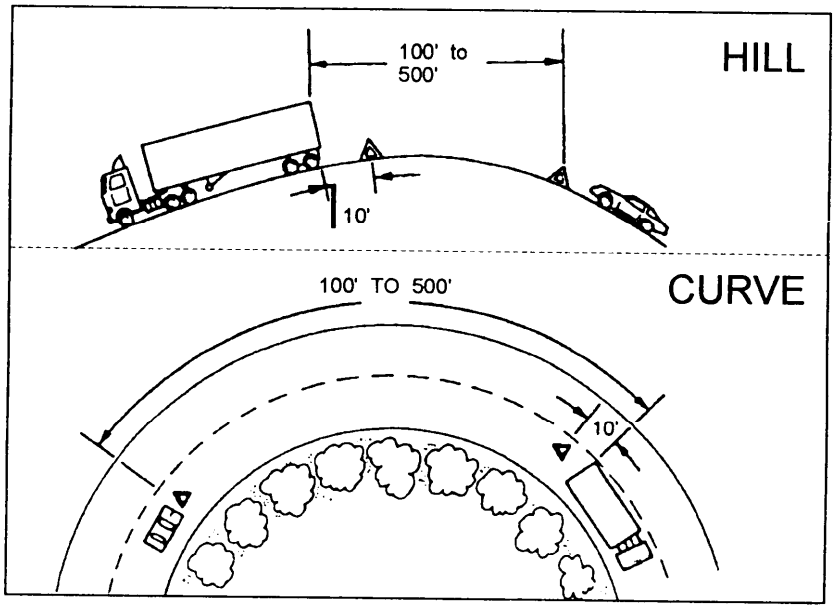


Figure 7-26.—Reflective triangle placement: obstructed view.

tractor-trailer on the shoulder or in the lane you are stopped in, as shown in figure 7-25.

2. If you are stopped beyond any hill, curve, or other obstruction that prevents other drivers from seeing the tractor-trailer within 500 feet, place reflective devices, as shown in figure 7-26.

3. If you are stopped on or by a one-way or divided highway, place reflective triangles 10 feet, 100 feet, and 200 feet toward the approaching traffic, as shown in figure 7-27.

When driving a tractor-trailer, you must maintain a safe following distance to avoid a rear-end collision. A

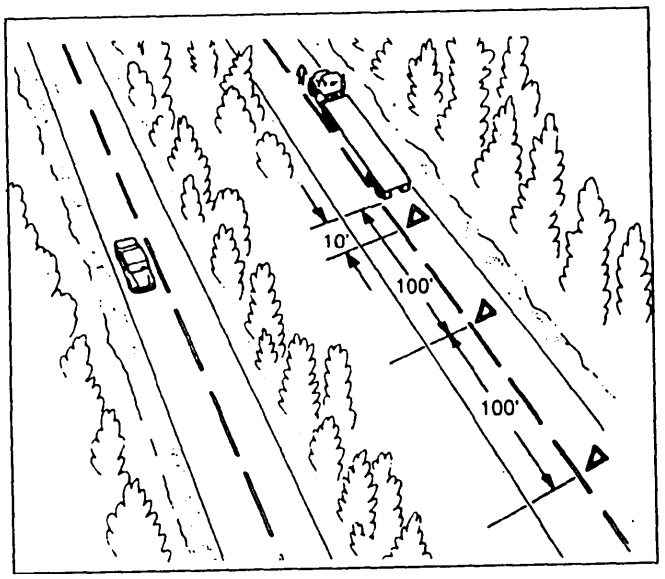


Figure 7-27.—Reflective triangle placement: one way or divided highway.

rule of thumb used for measuring how much distance you should maintain from the vehicle in front of you is at least 1 second for each 10 feet of vehicle length at speeds below 40 mph. At greater speeds, you must add 1 second for safety; for example, if you are operating a 40-foot vehicle, you should allow at least 4 seconds between you and the vehicle ahead. In a 60-foot tractor-trailer, you need 6 seconds. For over 40 mph, you need 5 seconds for a 40-foot vehicle and 7 seconds for a 60-foot tractor and trailer.

To measure distances, wait until the vehicle ahead passes a shadow on the road, a pavement marking, or some clear landmark. Then count off the seconds as "one thousand-and-one, one thousand-and-two" and so forth, until your vehicle reaches the same spot. Compare your count with the rule of 1 second for every 10 feet of length. If you are operating a 40-foot truck and only counted up to 2 seconds, you are too close.

LOADING AND SECURING CARGO

As a tractor-trailer operator, you must have an understanding of the basic procedures and safety rules used when transporting construction supplies and equipment. Improper loading of any load can be a danger to yourself and others around you, cause damage to the tractor-trailer, affect the steering of the tractor, and so forth. The **operator,** whether or not you loaded and secured the load yourself, is responsible to inspect the load, to recognize overloads and poorly balanced weight, and to ensure that the load is properly tied, strapped, or chained down, and covered (if required).

NOTE: It takes less time to tie down a load than it takes to report the reason a load fell off a trailer.

Vehicle Weight Definitions

The operator is responsible for knowing how much weight is loaded on the tractor-trailer and knowing the total weight of both the unit and cargo. The terms used for vehicle weight is as follows:

Payload allowance or payload is the maximum weight of material that can be transported.

Gross vehicle weight (GVW) is the total weight of a single vehicle plus its load.

Gross combination weight (GCW) is the total weight of a powered unit including the trailer(s) and cargo.

Gross vehicle weight rating (GVWR) is the maximum GVW specified by the manufacturer for a single vehicle, including the load.

Gross combination weight rating (GCWR) is the maximum GCW specified by the manufacturer for a specific combination of vehicles, including the load.

Curb weight is the total weight of the empty truck with the fuel tank, cooling system, and crankcase filled. Additionally, it also includes the weight of tools, spare tire, and all other equipment specified as standard. However, this weight does not include the weight of the payload and operator.

Axle weight is the weight transmitted to the ground by one axle or one set of axles.

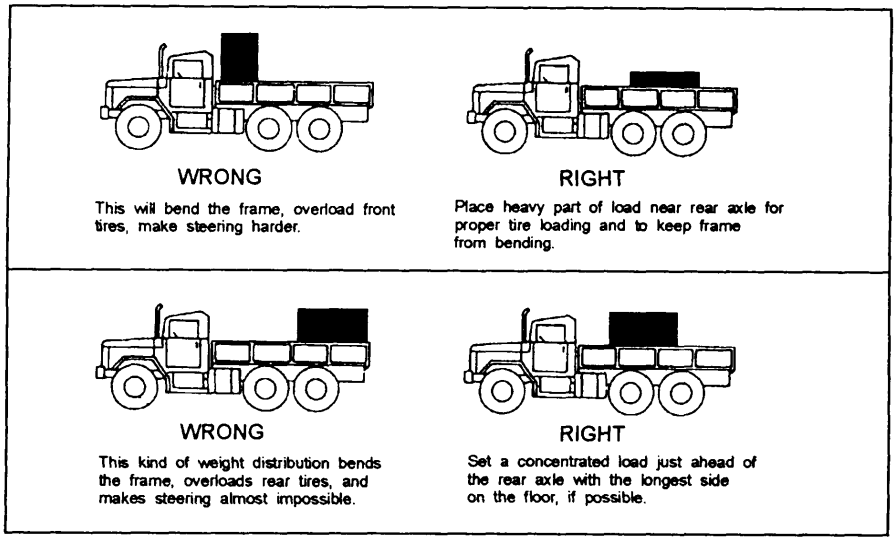
Tire load is the maximum safe weight a tire can carry at a specified pressure. This rating is stated on the side of each tire.

Suspension systems have a manufacturer's weight capacity rating.

Coupling device capacity are rated for the maximum weight they can pull and/or carry.

Operating Conditions

The maximum payload of a truck is determined by subtracting the curb weight and weight of the driver (175 pounds) from the manufacturer's gross vehicle weight rating. The maximum gross vehicle weight rating for a specified operating condition applies only when the tires and equipment on the truck are according



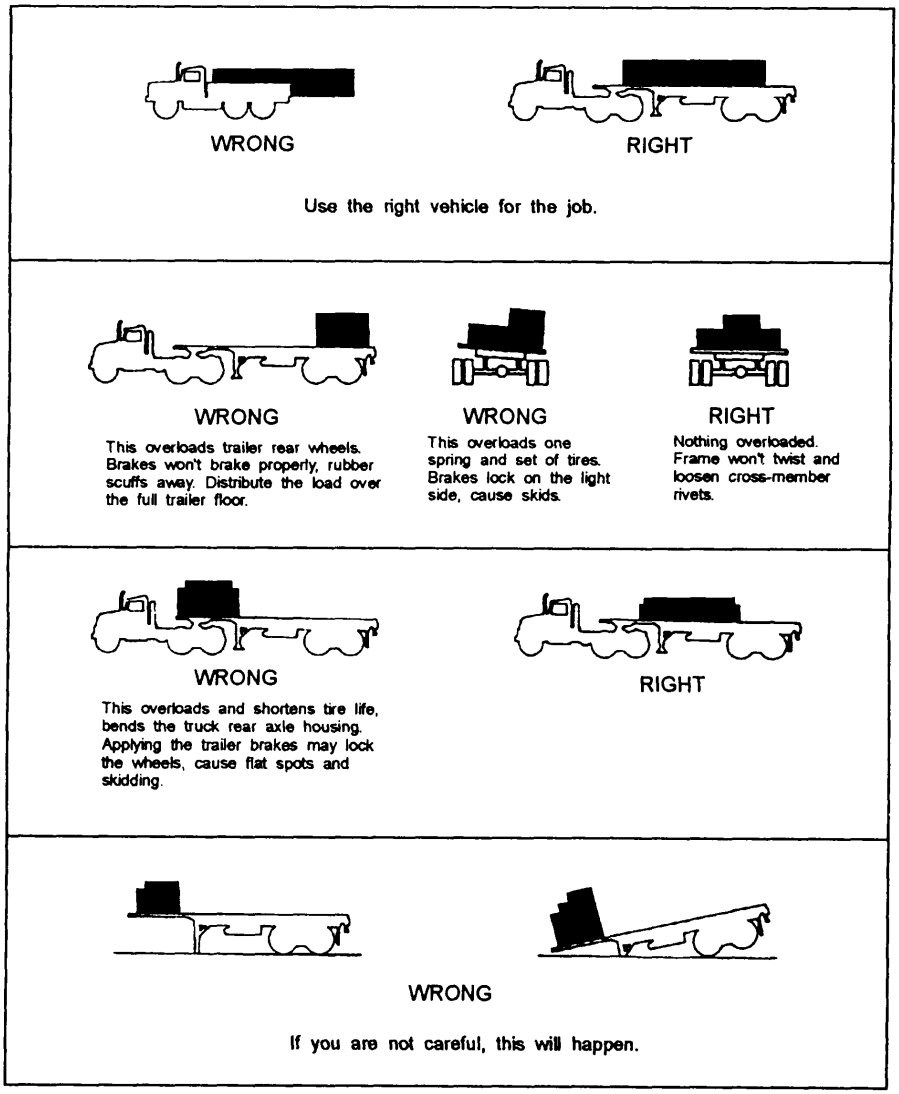


Figure 7-28.—Correct placement of payload.

to the manufacturer's recommendations for the specified operating condition; that is, ideal, moderate, or severe.

IDEAL CONDITION.— An ideal condition is when a truck is operated over improved, level roads, such as asphalt or concrete, at constant, relatively moderate speeds with no adverse weather or road conditions. Under these conditions, recommended payload equals 100 percent of maximum permissible payload.

MODERATE CONDITION.— A moderate condition is when a truck is operated at high speeds over improved highways, such as asphalt or concrete, with or without long or steep grades. Moderate conditions also include operating at moderate speeds over semi-improved roads with gravel or equivalent surfacing, in gently rolling country with few steep grades and no adverse weather or road conditions. Under these conditions, recommended payload equals 80 percent of maximum permissible payload.

SEVERE CONDITION.— A severe condition is when the vehicle is operated off the highway on rough or hilly terrain or over unimproved or pioneer access roads with deep ruts, holes, or steep grades. These conditions also include operating where traffic has created deep holes or ruts in heavy snow, covering normally good city streets or highways. Under these conditions, the recommended payload equals 64 percent of the maximum permissible payload.

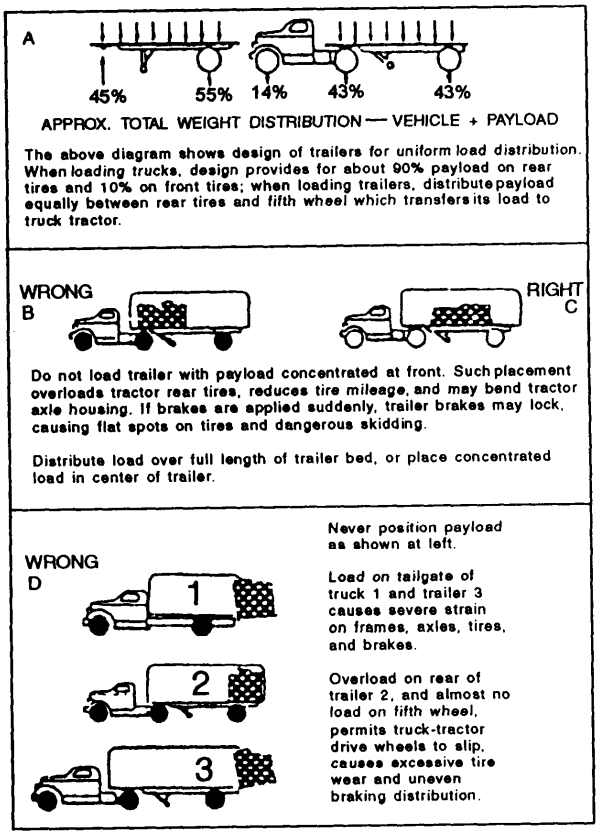


Figure 7-29.—Distribution of weight.

Weight Distribution

Distribution of cargo has a definite bearing on the life of tires, axles, frame, and other parts of the vehicle. The fact that a truck or trailer is not loaded beyond its gross vehicle weight capacity does not mean that the individual tires and axles may not be overloaded by faulty distribution of the cargo. Additionally, states have maximums for GVW, GCW, and axle weights. Axle weights prevent the overloading of bridges and roadways. Some examples of proper and improper placement of the load are shown in figure 7-28.

To load a truck or tractor-trailer properly, you have to determine the center of the payload. In a truck, the position of the center of the payload is the center of the body or the point midway between the rear of the driver's cab and the tailgate. In a tractor-trailer unit, the position of the center of the payload is roughly the center of the trailer body, because the front wheels of the tractor seldom carry any of the payload. When you are loading, ensure that the maximum capacity of the vehicle is not exceeded over any one axle and, if possible, that loads are distributed so there is less-than-maximum axle loading. Examples of approximate distribution of total weight are shown in figure 7-29.

The payload weight must be distributed over the body properly so the percentage of weight carried by the front axle and that carried by the rear axle equals the ratio for which the vehicle was designed, as shown in figure 7-29.

Loading Cargo

The tractor-trailer can be adapted to transport various types of materials, such as fragile, bulky, compact, dense, rough and high center-of-gravity items. To accommodate a variety of items, you must plan the load, properly prepare the tractor-trailer, and secure the load to the vehicle. Securing the load by restraining it with proper lines, cargo straps, chains, or fastened by tie-downs or binders should keep it from shifting or falling off the vehicle. Should a load fall from a vehicle, it could foul underpasses, culverts, bridge abutments, and create a hazard to pedestrians. Protect fragile items

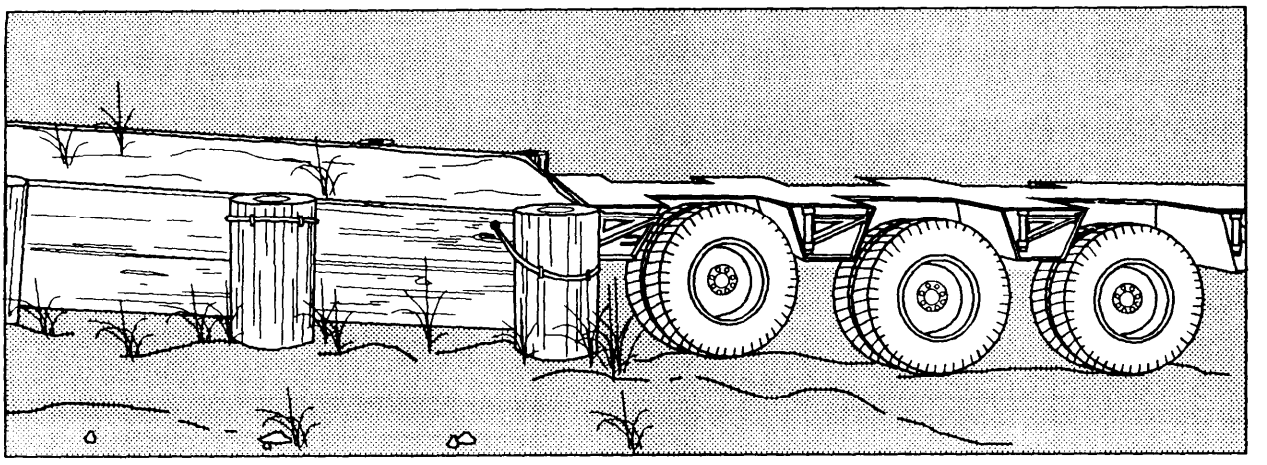


Figure 7-30.—Permanent loading ramp.

from damage by chafing (rubbing together) with cardboard, paper, cloth, or other filler.

Loading Equipment

Loading equipment onto a trailer is dangerous. In most cases the equipment will be just as wide as the trailer with a little room for error. Always use a guide to ensure that the equipment is on the trailer straight and that you do not run it off the trailer.

Regardless of what type of equipment you are loading or what type of trailer you are using, there are general rules that apply. The rules are as follows:

1. Have the equipment in line with the trailer and the transmission placed in low gear. Increase the throttle of the tractor just high enough to have power to pull itself onto the trailer.

2. Watch and follow your guide.

3. Do not steer sharply.

4. Do not stop except for an emergency.

5. For crawler machines only, move slowly at the top of any ramp or a jarring fall can result when the machine is past the balance point.

6. Center the equipment on the trailer to load the truck-tractor and trailer axles evenly.

LOW-BED TRAILER.— When loading a low-bed trailer with a self-propelled machine, you must use a ramp, blocks, bank or pile of dirt, or a ditch.

Portable ramps are heavy and hard to handle and require as many as four people to lift, carry, and set up. In most equipment yards, a permanent ramp is constructed of timber or concrete (fig. 7-30) to support the loading and unloading of equipment.

Blocks can be used to load crawler equipment but are not recommended for wheeled equipment. Use blocks if you have nothing else; however, be cautious because the machine will be at a greater angle than desired when the balance point is met (fig. 7-31.)

When a trailer can be backed against a bank or into a ditch, you may load or unload without the use of ramps.

When you have to load a machine and you do not have ramps, blocks, or ditches, you may have to push up a pile of dirt from which to load. Do not dig a hole in finish grade or any place you would have to smooth out. But, if you do push up a pile of dirt for a ramp, ensure the ramp angle is not too steep (3 feet out for every 1 foot up). Ensure the ramp is wider than the trailer and somewhat compacted to support the ground-bearing pressure of the equipment.

TILT-BED TRAILER.— A tilt-bed is like having portable ramps all the time. The bed will tilt (fig. 7-32) for the load to move up and forward of the balance point. As the load continues to move forward, the bed lowers into the transport position. Ensure the tilt-bed locking device and safety lock, as shown in figure 7-6, are opened before the bed is lowered.

WARNING

When using a tilt-bed trailer to haul equip ment, do not attempt to load or unload equipment from a ramp or dock as would be performed when using a low-bed trailer. This action is dangerous and causes severe damage to the tilt-bed trailer and the tilt-bed deck-locking mechanism.

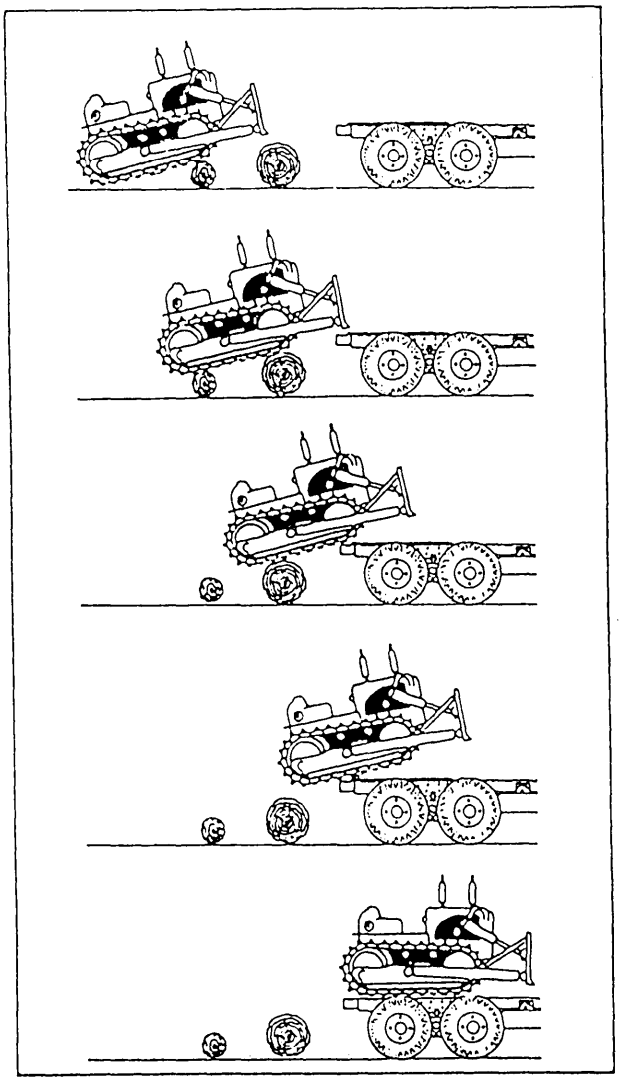


Figure 7-31.—Loading crawler equipment using blocks.

CAUTION

Using a tilt-bed trailer in damp or wet conditions is extremely dangerous and can cause uncontrollable sliding of equipment off the trailer during loading and unloading operations.

DETACHABLE GOOSENECK TRAILER.— Detachable gooseneck trailers are designed so when the gooseneck is detached you can load a machine from the front without any ramps or tilting of the deck at the balance point.

The gooseneck and frame are held together in alignment by removable pins or safety locks. Removing or releasing the pins or safety locks and disconnecting the brake and electrical lines, the two units are lowered to the ground by a hydraulic jack in the gooseneck or by a line from a winch mounted on the tractor. The gooseneck is then detached from the frame and carried or dragged a short distance by the tractor.

Ramps are flipped over to rest on the ground, and the equipment is driven up onto the trailer. The gooseneck is backed into place, attached, lifted, and locked. The brake and electrical line are reconnected, and the ramps are folded onto the deck of the trailer.

You can also load from the rear, like a regular low-bed trailer. Before you operate this type of trailer, read and understand the operator's manual. These trailers have low ground clearance, so take extreme care when crossing any high point in the roadway, such as railroad tracks, speed bumps, and dips.

Securing Cargo

Regardless of what type of truck you are operating, material you are hauling, or how far you are hauling it, your load must be secure from falling or shifting. When a load shifts, the weight of the load has moved also. This could cause an axle to be overloaded and mechanical failure to occur.

Certain conditions can cause cargo being transported to shift; however, almost all cargo movement can be controlled with the use of proper blocking and bracing. Blocking is used in the front, back, and/or sides of a piece of cargo to keep it from sliding. Blocking

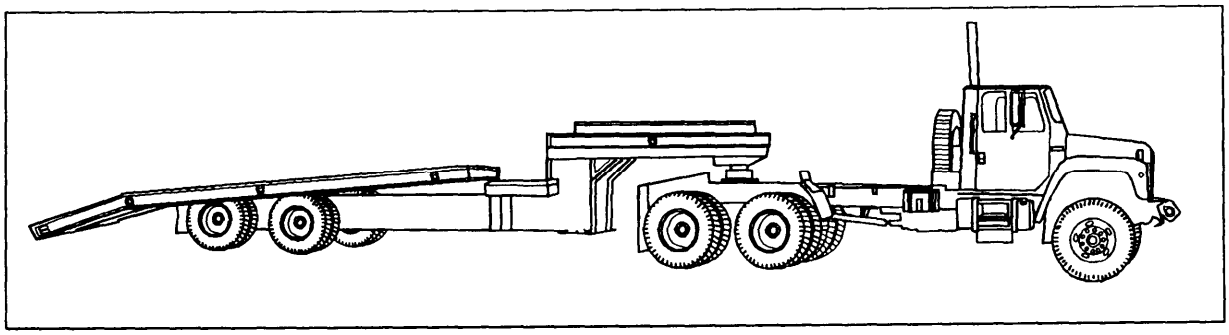


Figure 7-32.—Tilt-bed trailer with bed in the tilt position.

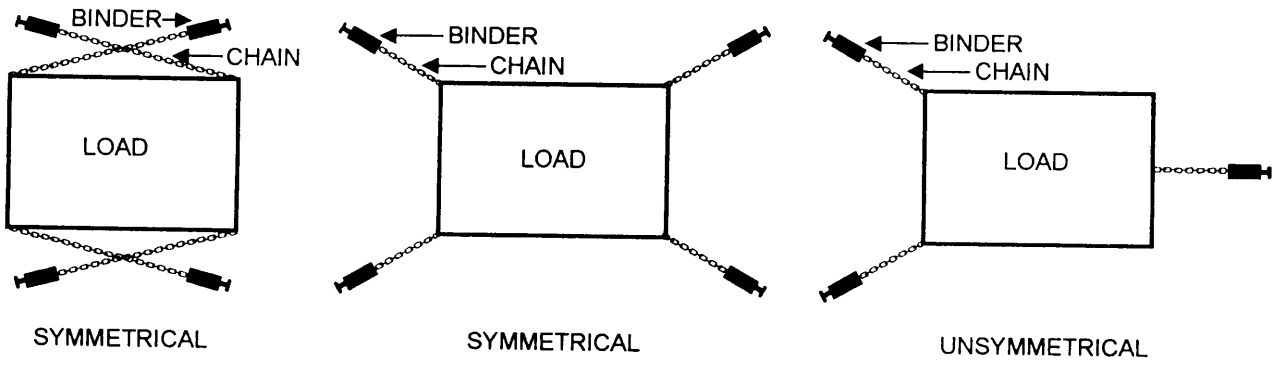


Figure 7-33.—Symmetrical tie-down pattern.

should be shaped to fit snugly against the cargo and should be secured to the deck of the trailer to prevent the cargo from moving. **Bracing** is also used to prevent movement of the cargo. Bracing is placed from the upper part of the cargo to the floor and/or walls of the cargo compartment.

Because cargo loads have a tendency to shift, a common rule of thumb is to inspect the cargo and the securing devices before departing and within 25 miles after beginning a trip. Always check the cargo and securing devices as often as necessary during a trip to keep the load secured. Inspect the cargo and securing devices after you have driven for 3 hours or 150 miles and after every break taken during the trip.

LOOSE MATERIAL.— Dump trucks are often used to haul loose material. Soil, aggregate, and sand are examples of cargo that is categorized as loose material. When you are operating dump trucks, be sure that no part of the load can fall off your truck when making turns. You should stop loading before it reaches the top of the side or end gate. Dirt spilled in curves and turns creates driving hazards and should be cleaned up daily. Another hazard created by loose material is a broken windshield caused by aggregate falling from dump trucks.

NOTE: In some states and on some deployment locations, it is a requirement that all loose material loads carried in dump trucks must be covered.

BUILDING MATERIAL.— When loading steel, lumber, or anything that must be unloaded with a forklift or crane, you should place 4 by 4 timbers or pallets under the load. This helps get forks or cables in and out from under the load

RESTRAINTS.— Loads must be secure enough to prevent movement in any direction, which means movement forward, aft, vertically, and horizontially.

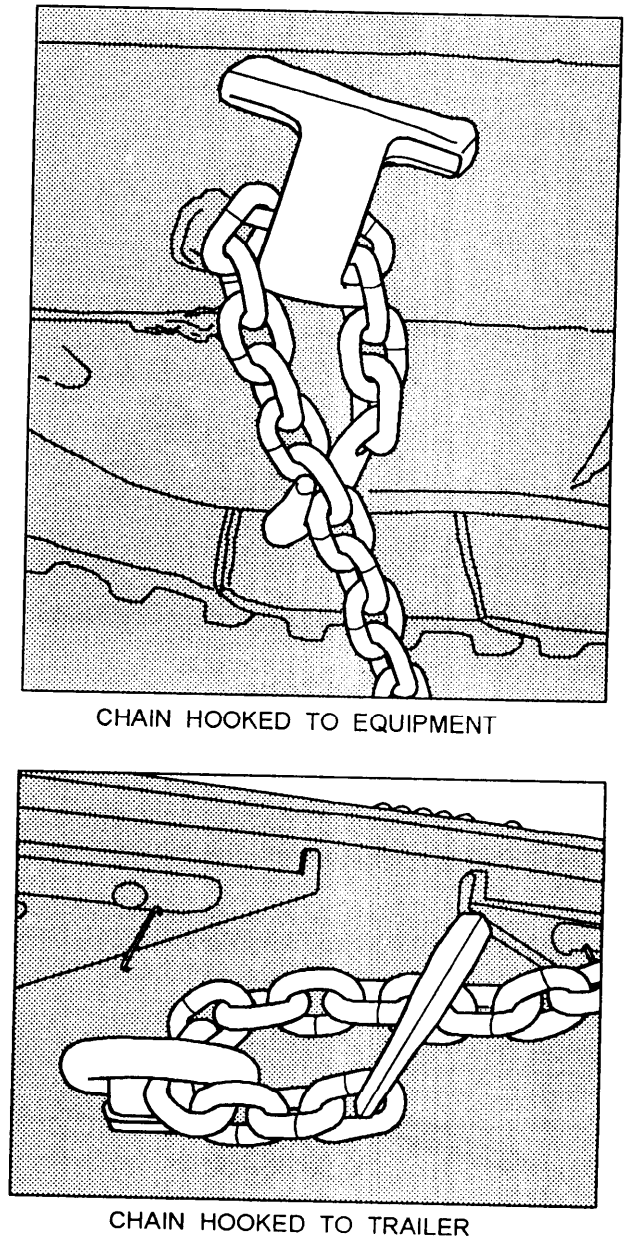


Figure 7-34.—Chains properly hooked on the equipment and trailer tie-down eyes.

When securing loads, place the tie-downs in a symmetrical pattern, as shown in figure 7-33.

A tie-down assembly must have a safe working load (SWL) of 1 1/2 times the weight of the load to be restrained. For example, to restrain a crawler tractor weighing 55,000 pounds, you need a tie-down assembly for 82,500 pounds (55,000 x 1.5 = 82,500). This means you need eight 1/2-inch chains with an SWL of 11,000 pounds each and eight binders with 1/2-inch hooks.

On flatbed or lowboy trailers without sides, cargo must be secured to the trailer to keep it from shifting and falling off. In closed van trailers, tie-downs can also prevent cargo from shifting that may affect the handling of the vehicle. Tie downs must be of the proper type and strength. The combined strength of all tie-downs must be strong enough to lift 1 1/2 times the weight of the piece of cargo tied down.

Chains.— Chains make up most of our tiedown assemblies. The size of chains normally used in the NCF is 3/8 and 1/2 inch. They are made of the class A type of alloy steel. Know the safe working load of any chain before you put it to use.

Chains used for restraints should have grab hooks on both ends. Attach the hook into the chain as close as possible to the tie-downs on the trailer and on the equipment (fig. 7-34). This prevents the chain from getting slack once the binder is attached and closed.

Binders.—Binders are chain-tightening devices that are made of steel with swivels, chain hooks, and a lever. You hook one of the binder hooks on the chain near the trailer deck and the other hook higher up the chain near the load. The chain is tightened by pulling the lever down, as shown in figure 7-35. A 3-inch-diameter 3-foot-length pipe, commonly known by the term **cheater bar,** is normally used on the lever to provide more leverage when closing the binder.

WARNING

When you are closing and opening the lever, do not put your head or arm in line with the lever. If you lose your grip, the lever will open and hit you.

EQUIPMENT.— Assume the equipment has been loaded as described earlier in this chapter.

Place your tie-down assemblies to the correct tie-down on the equipment. Be sure you do not put a chain around any hydraulic, fuel, or brake lines, because they will be crushed when the binders are closed. Ensure you secured all movement symmetrically, as shown in figure 7-33, so that the equipment cannot move forward, aft, vertically, or horizontally.

CAUTION

When transporting equipment equipped with turbochargers, seal off the exhaust stacks to prevent alterations of the turbocharger turbine due to wind velocity. Failure to do so can result in damage to the turbine bearings due to the lack of lubrication.

OVERSIZE AND OVERWEIGHT LOADS.— Oversize and overweight loads require special permits.

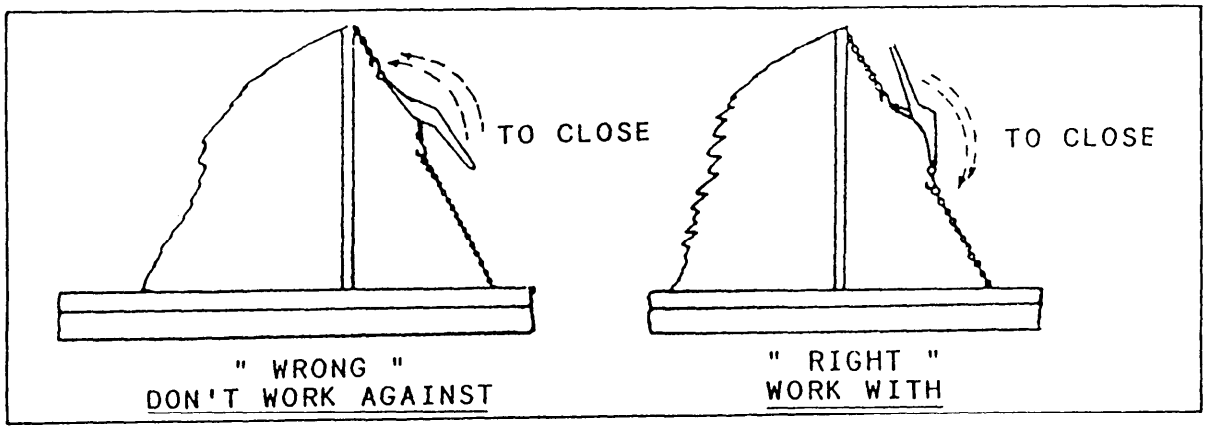


Figure 7-35.—Using load binders.

Driving is usually limited to certain times of the day and requires special equipment, such as "wide load" signs, flashing lights, flags, police escort or pilot vehicles bearing warning signs, and/or flashing lights.

NOTE: Weight, height, and width limitations are set forth by each state. Always know the weight, height, and width of the load you are pulling and the regulations for the state(s) you are to operate in.

DUMP TRUCKS

The Naval Construction Force (NCF) uses many shapes and sizes of dump trucks ranging from 2 1/2 tons to 20 tons to perform construction and disaster repair operations and up to 25 tons to support quarry operations. Although there are a different variety of types of dump trucks used, the principles of operation are the same. As an operator, you are responsible for

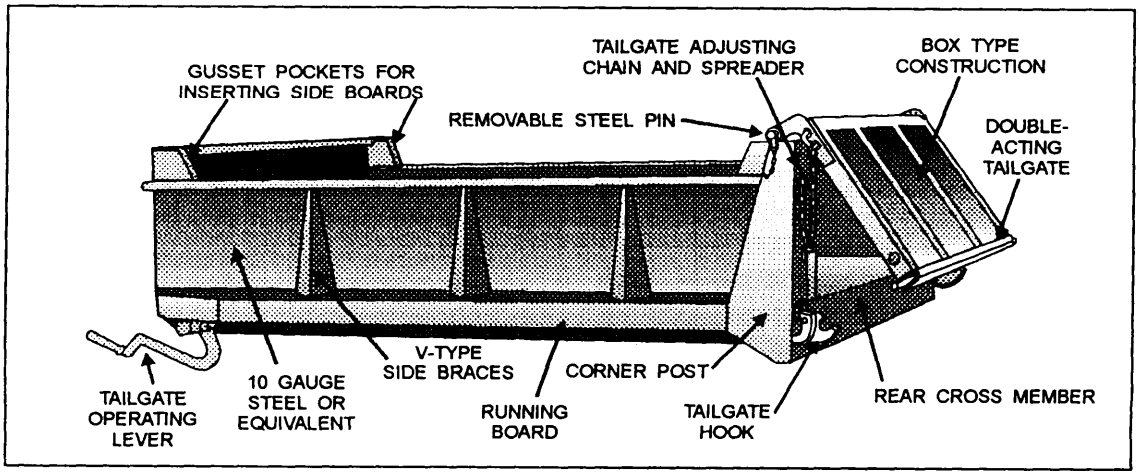


Figure 7-36.—Dump truck body components.

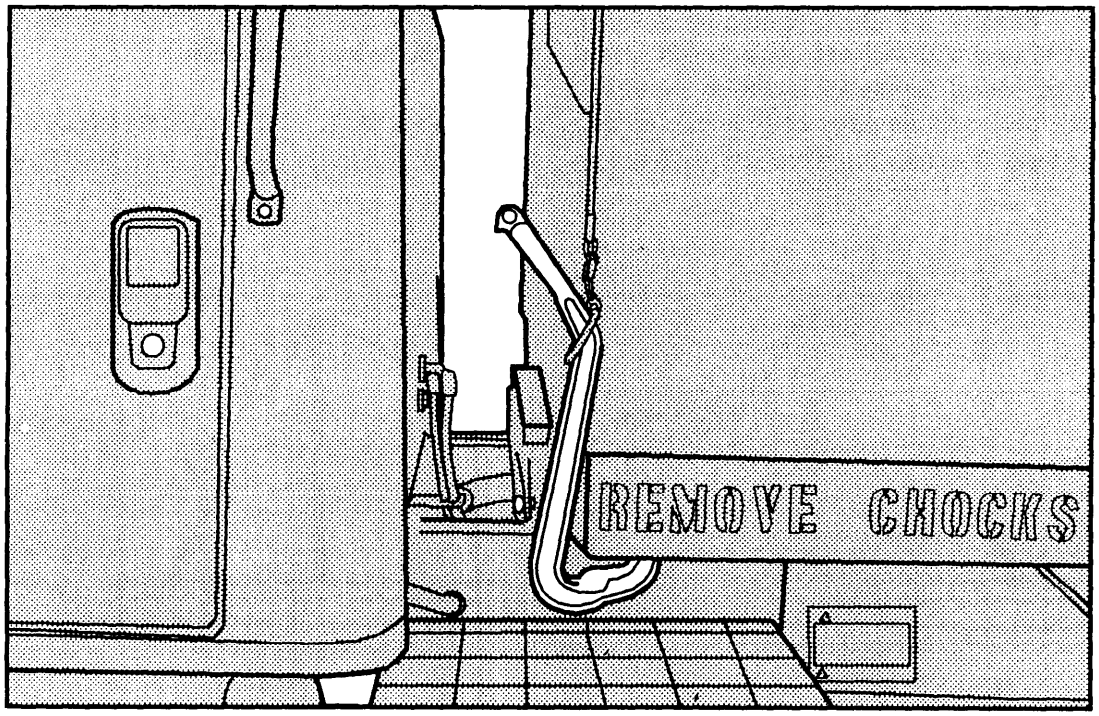


Figure 7-37.—Tailgate operating lever.

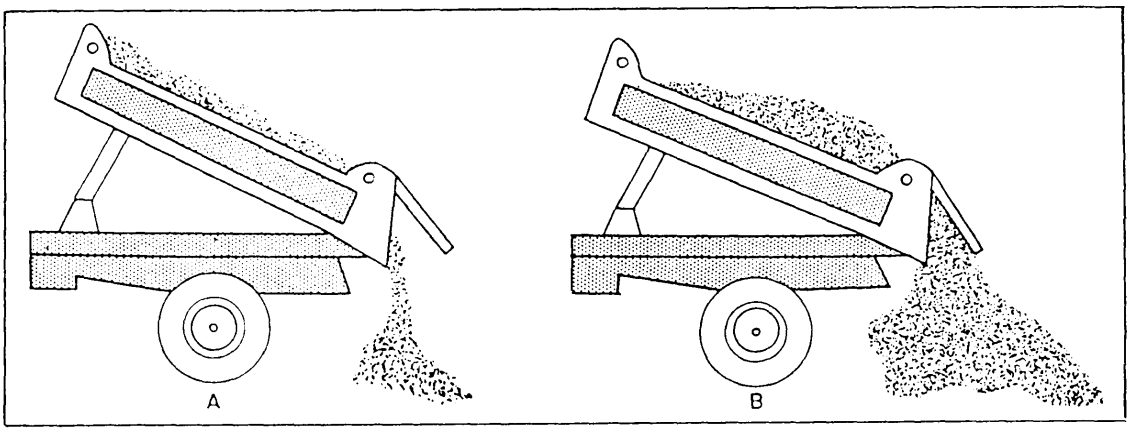


Figure 7-38.—Dumping the load.

reading and understanding the operator's manual for the model of dump truck you are assigned to operate. This section covers the basic characteristics and operations of dump trucks.

CHARACTERISTICS

A typical dump truck is equipped with a dump body that is hinged to the rear of a subframe which is mounted directly on the truck chassis. Dump bodies range in structural strength and size to support different operations. That is why it is important that the operator knows the design and capacity of the dump truck assigned to operate. You do not want to haul quarry rock in a dump body designed to haul and heat asphalt. The quarry rock can damage the dump body and render it useless for asphalt operations. The components of a dump truck body are shown in figure 7-36.

A hydraulic hoist assembly is used to raise and lower the dump truck body. The hydraulic pump is driven by a propeller shaft connected to the power takeoff (PTO). A variety of ways are used to engage the PTO on dump trucks used in the NCF; therefore, consult the operator's manual for specific instructions on how to engage the PTO and hoist assembly.

DUMP TRUCK OPERATIONS

During dumping operations, the truck should be on level ground or inclined uphill with the front of the truck facing downward. When the truck is in position, release the lower latches of the tailgate with the hand lever at the front left corner of the body (fig. 7-37.) Then engage the control for the dump truck body. Hydraulic pressure will begin to hoist the dump truck body, and as the body rises, the load will slide backward under the open tailgate (fig. 7-38, view A). If the load piles up and blocks the tailgate (fig. 7-38, view B), place the truck in low gear and move it forward until there is more space to dump the remainder of the load.

If the load does not slide out easily, have someone dislodge it with a long-handled shovel, taking care not to stand in the immediate dumping area. When dumping a load of rocks or other large solids, see that the tailgate is latched at the bottom, but unfastened at the top, so that the tailgate can drop down and the load can drop, as shown in figure 7-39.

Not all dump trucks have tailgate wings. On those that do not, you have to drop the tailgate down and support it with chains. To spread a load over a large area,

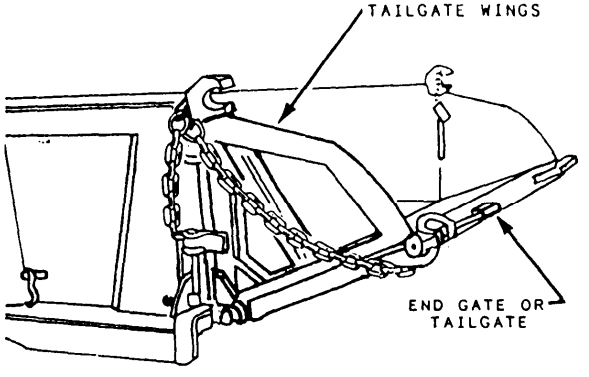


Figure 7-39.—Tailgate rigged for dumping large material.

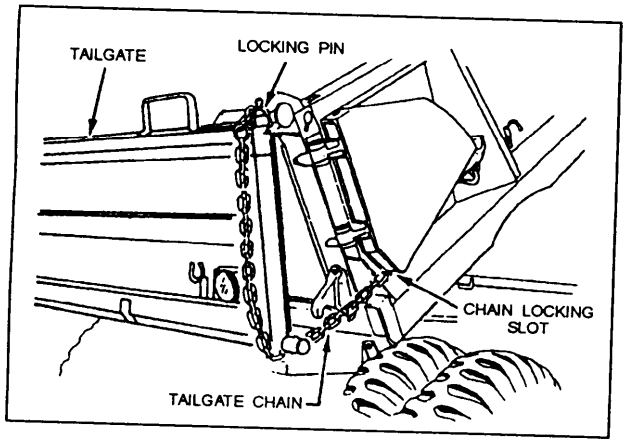


Figure 7-40.—Tailgate rigged for spreading operations.

shift the truck into low gear and drive it slowly forward while dumping, as shown in figure 7-40.

The dump truck body can be held in any position by returning the control lever to the HOLD position. When dumping is completed, lower the body by returning the control lever to the LOWERING position. Then close the tailgate latches.

The load in a dump truck should be distributed evenly. Heaped loads to the front put more strain on the hoist. Loads to one side can damage the hinge pins, the dump bed, or bend the truck chassis. Remember: If your load should be distributed unevenly and dumped on uneven ground, you could find yourself in great difficulty, as shown in figure 7-41.

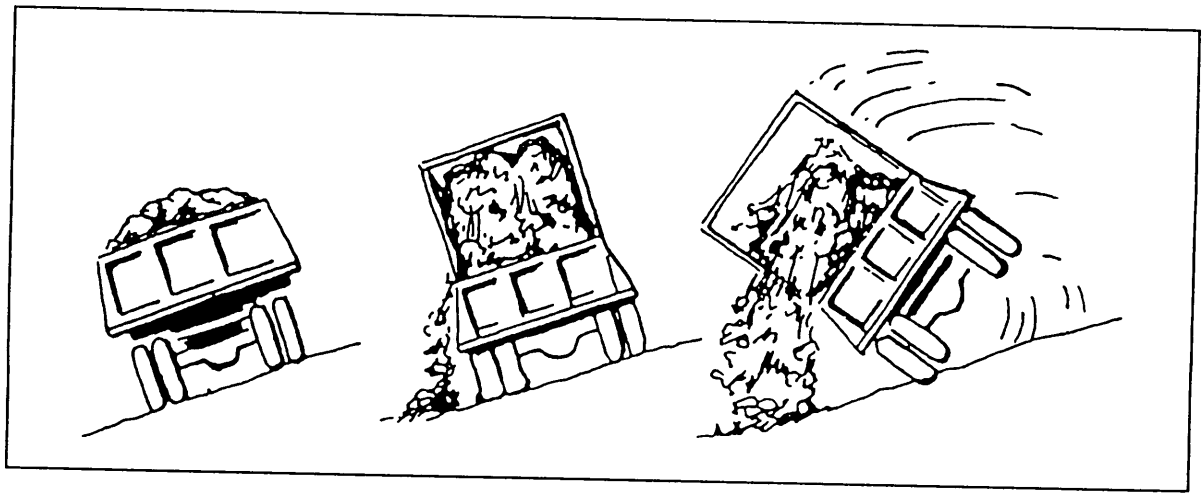


Figure 7-41.—Hillside dumping hazard.

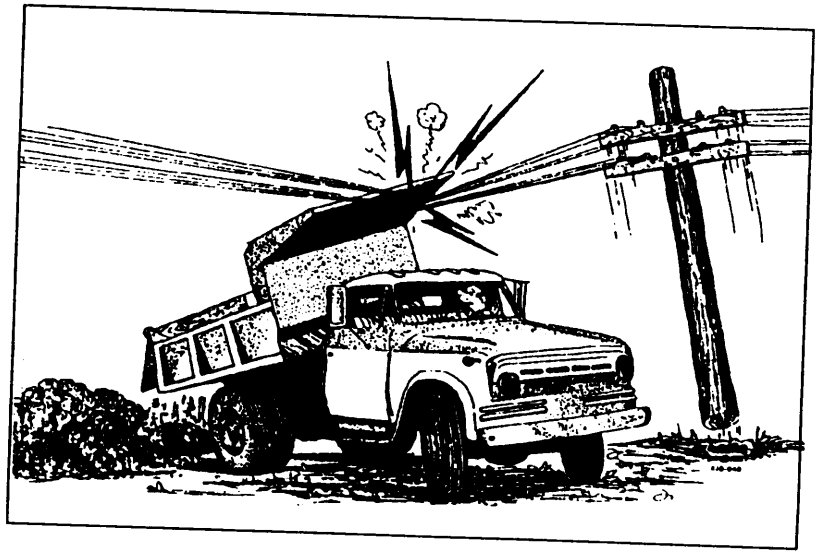


Figure 7-42.—Watch for overhead obstructions.

When regular rock dumps are not available, it may be necessary to haul large rocks in a dump body not designed for this purpose. The bed of the dump truck should then be lined with wooden planking so as not to damage the bed while the rock is being loaded. The tailgate should be latched again at the bottom but pushed out at the top, as shown in figure 7-39.

Before hauling asphalt, coat the inside of the bed with diesel fuel. The fuel prevents the asphalt from sticking to the dump bed. To control any rapid heat loss, cover the hot-mix with a tarpaulin that should be tied down securely to prevent flapping in the wind.

NOTE: Some states and countries require that all loose materials hauled in dump trucks must be covered to prevent spillage on roadways and breaking of vehicle windshields. Know the rules and regulations for the area you are to operate in.

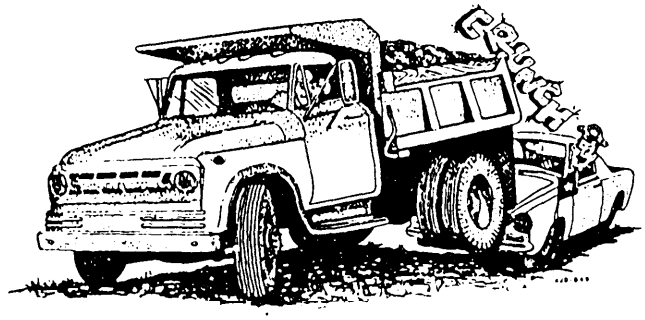


Figure 7-43.—Avoid backing accidents; use a backing guide.

When performing dumping operations, be careful of overhead obstructions, as shown in figure 7-42. Ensure the dump bed is completely lowered before proceeding. When backing, use a backing guide to avoid a backing accident similar to the one shown in figure 7-43.